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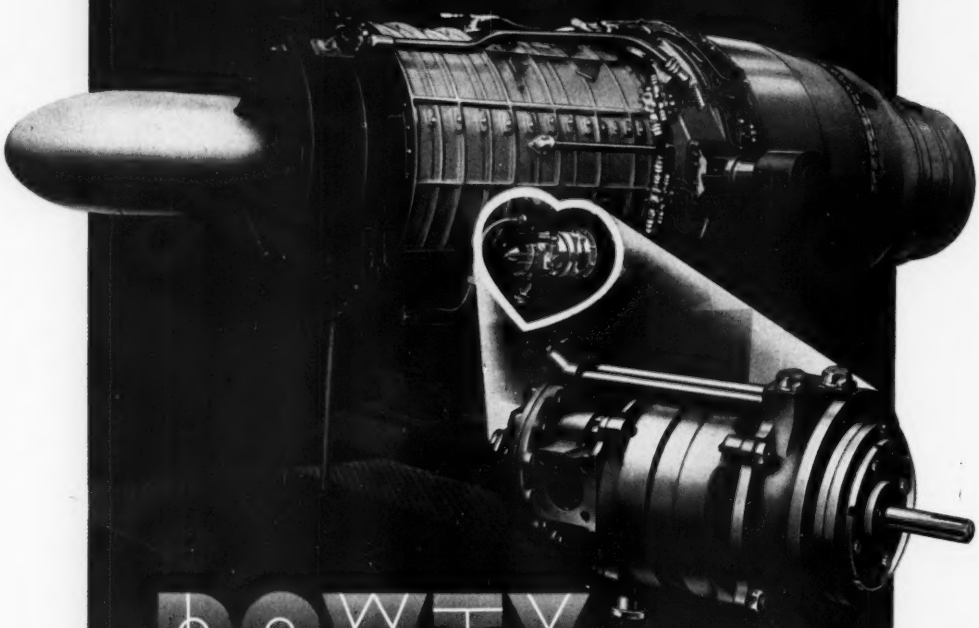

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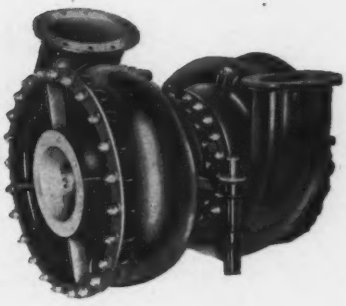
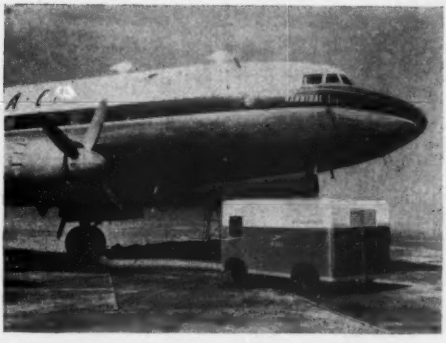
Cold Air Units



Godfrey cold air units, operating on an air-cycle refrigeration principle, are applied to many military and civil aircraft installations.

The Type CAE 7, as illustrated, is in production for the De Havilland "Comet", while a variant type is fitted to the Vickers "Viscount."



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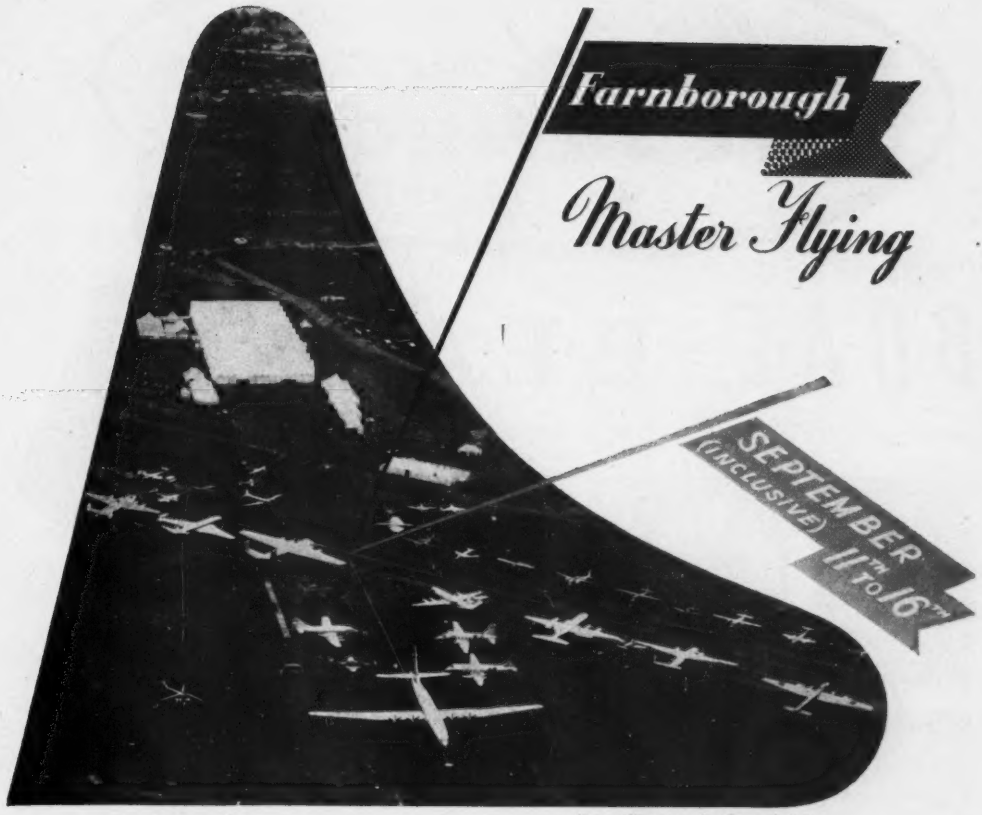

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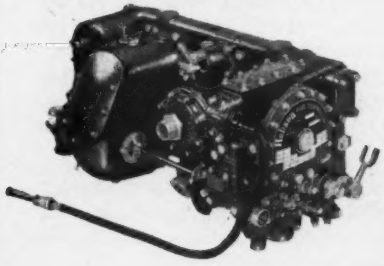

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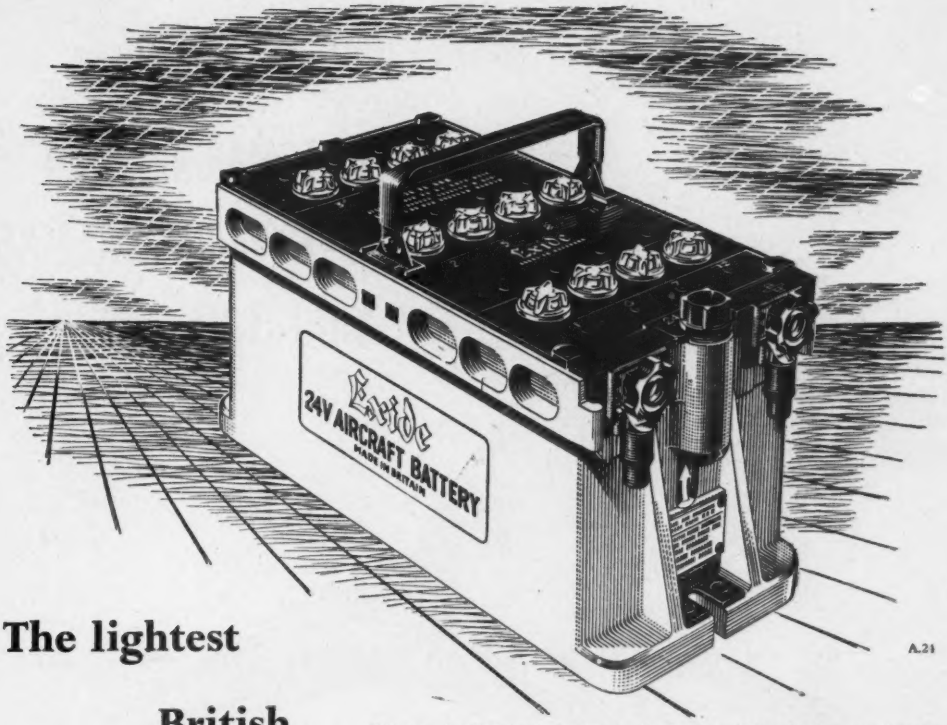

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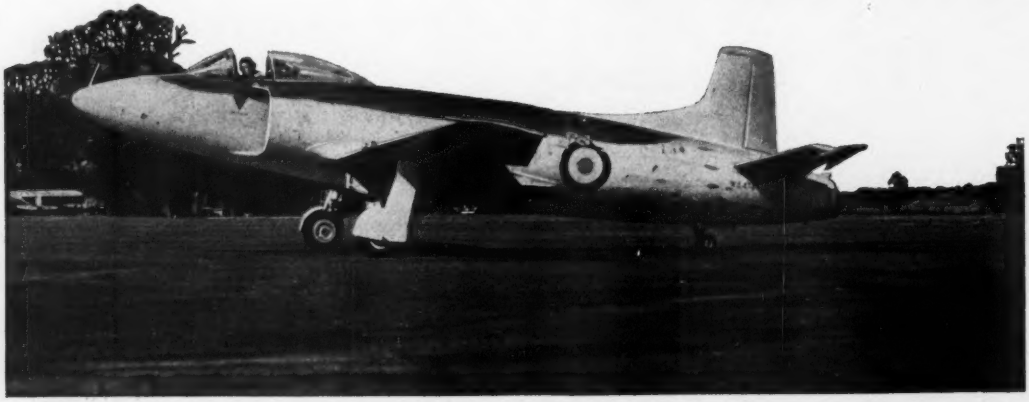

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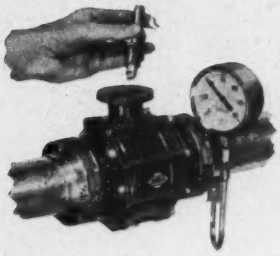

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for 4″ Pipelines

Diaphragm sealing having removed the hazard of leakage from the normal fuel pipeline, moves on to the control of other fluids and larger lines for aircraft of the future with cocks for 2½″, 3″, and 4″ systems.

As in the smaller cocks, these large-bore models have annular diaphragms which tighten their seal at the plug seats as the pressure increases, and a spindle diaphragm which flexibly unites moving spindle and fixed housing for the prevention of any leakage to atmosphere at this usually vulnerable point.

The full bore, low torque*, and glandless advantages of Saunders Spherical Plug Cocks are also present in these larger sizes. Attachment is by clamp ends with "V" or hose clips optional for the clamping agent.

Sizes, weights, and working pressures for the four large-bore motorised models are tabulated below.

The full range of Saunders S.P. Cocks with diaphragm sealing comprises ¼″, ⅜″, ½″, ⅝″, ¾″, 1″, 1¼″, 1½″, 2″, 2½″, 3″, and 4″. (2″, 2½″ and 3″ cocks have motors fitted vertically. 4″ models employ a horizontal layout as illustrated)

* An auxiliary reduction gear is incorporated in the 4″ motorised unit to reduce operating speed to a rate suitable for such a large volume of fluid and to meet the requirements of pressure refuelling.

Inset above:—Demonstrating removal of spindle under pressure.
Right: Saunders 4″ Motorised, geared, Spherical Plug Cock.

SIZE (and type of end)	Length	Height from pipe centre	Weight lbs.
2″ clamp	4.82″	9.10″	3.82
2″ screwed	5.85″	9.10″	3.97
2½ clamp	5.30″	10.54″	7.09
3″ clamp	5.88″	10.85″	8.27
4″ clamp	11.11″	6.94″	13.00

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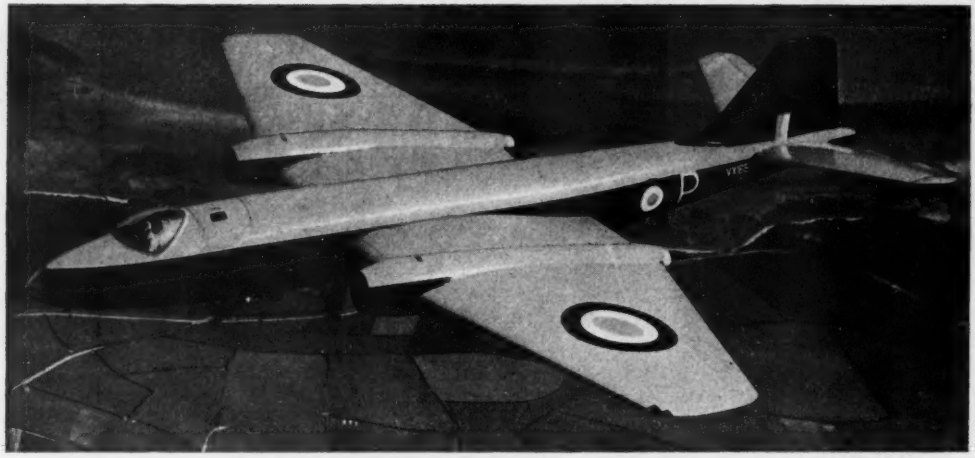

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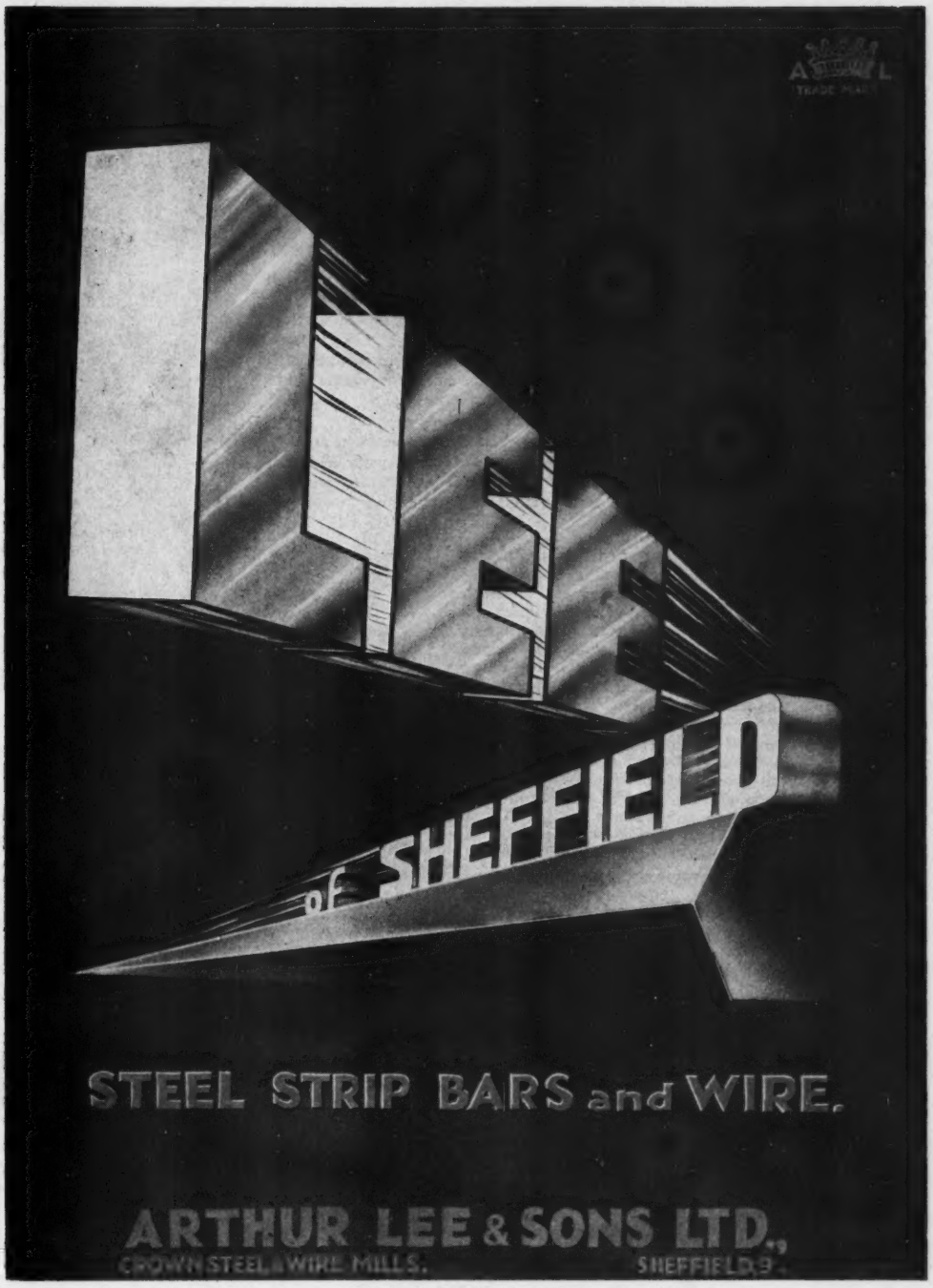

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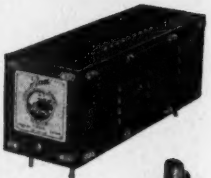
New ideas and improvements in fire fighting systems for aircraft and airfields continue to flow from the Pyrene Aircraft Laboratory, consequently modern aircraft may be safeguarded with the latest forms of "Pyrene" Combined Smoke Detecting and Fire Extinguishing Systems. For crash fires in airfields there is the new improved "PYRENE" Crash Tender; for "starting-up" fires, the "PYRENE" C.D.T. 212 Trolley with automatic extending applicator. There are also "PYRENE" Foam-making Branchpipes and Foam Generators capable of producing Mechanical Foam in great abundance for large oil and spirit fires. There is also the range of "PYRENE", "CONQUEST" and "PHOMENE" Fire Extinguishers for various fire risks and the new Pyrene "wet" water fire extinguisher for aircraft.



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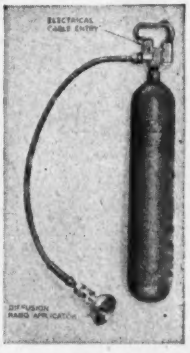
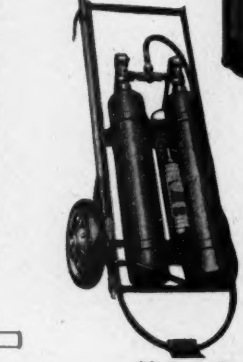
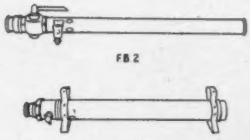


CO_2 Duo Head Extinguisher



CO_2 Trolley for "starting-up" fires



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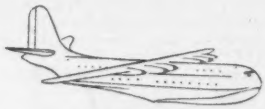

ALL
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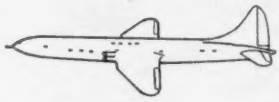

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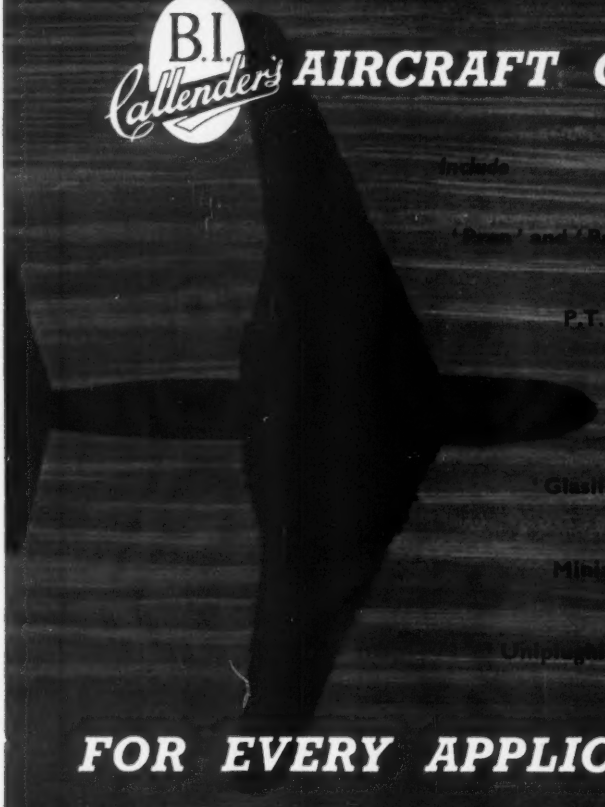

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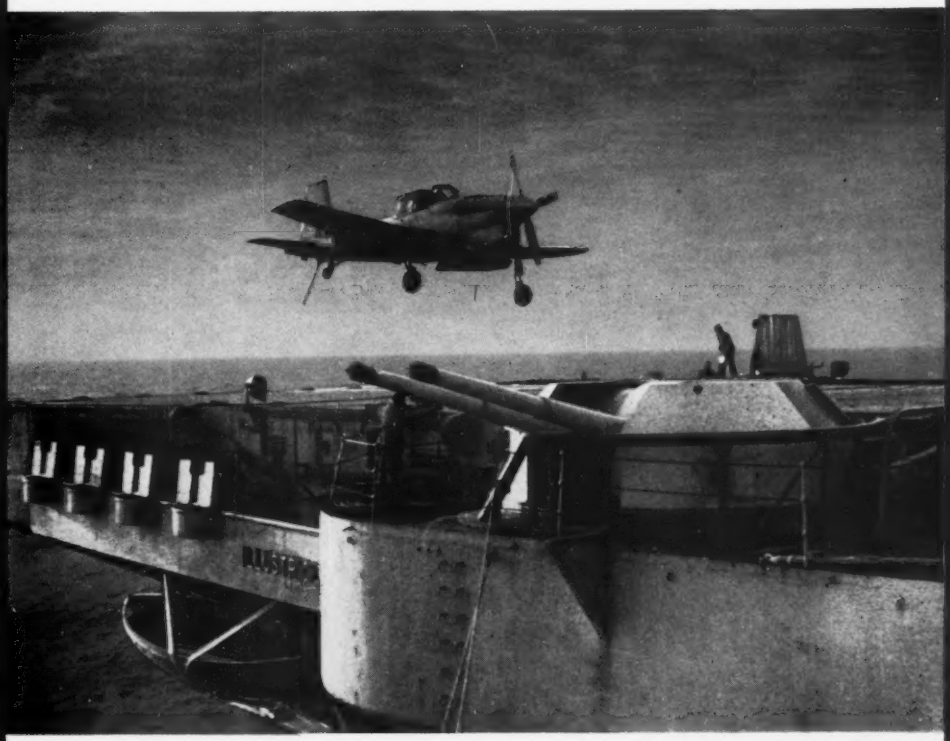

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The Ground Beacon and Aerial System can be seen at Stand 15 at the S.B.A.C. Exhibition at Farnborough.

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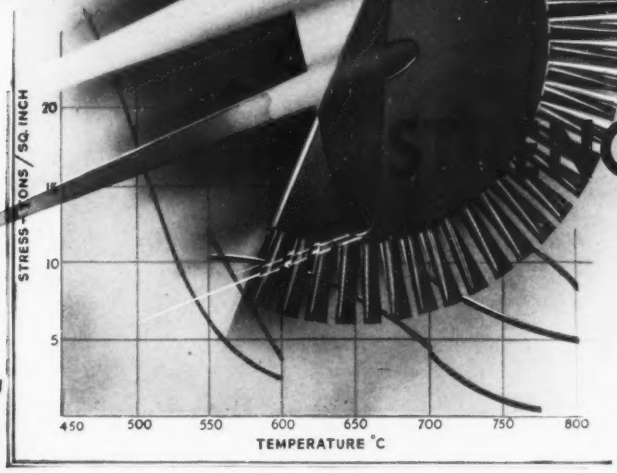

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S.B.A.C. Exhibition and Flying Display
FARNBOROUGH 11-16 SEPT. 1951

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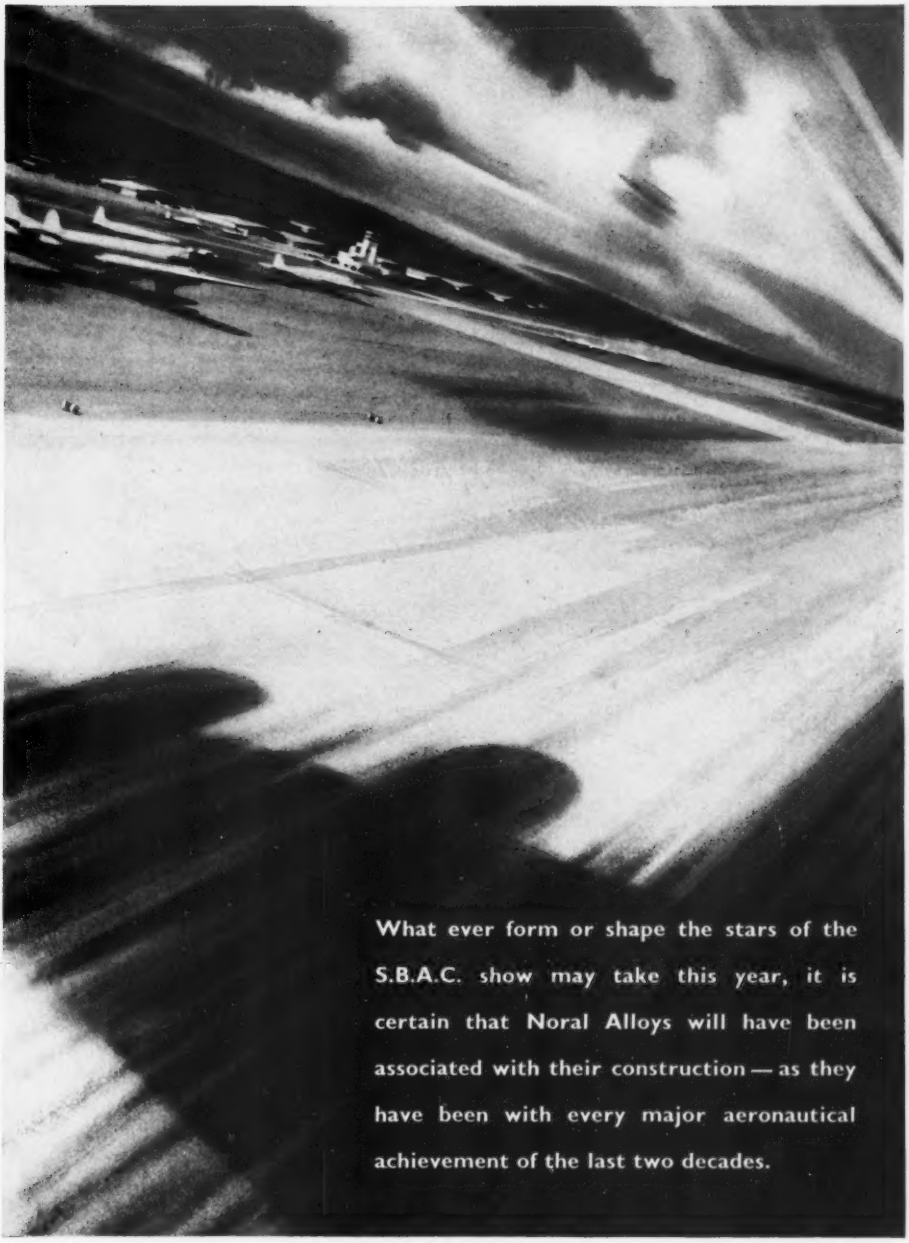
What ever form or shape the stars of the S.B.A.C. show may take this year, it is certain that Noral Alloys will have been associated with their construction — as they have been with every major aeronautical achievement of the last two decades.

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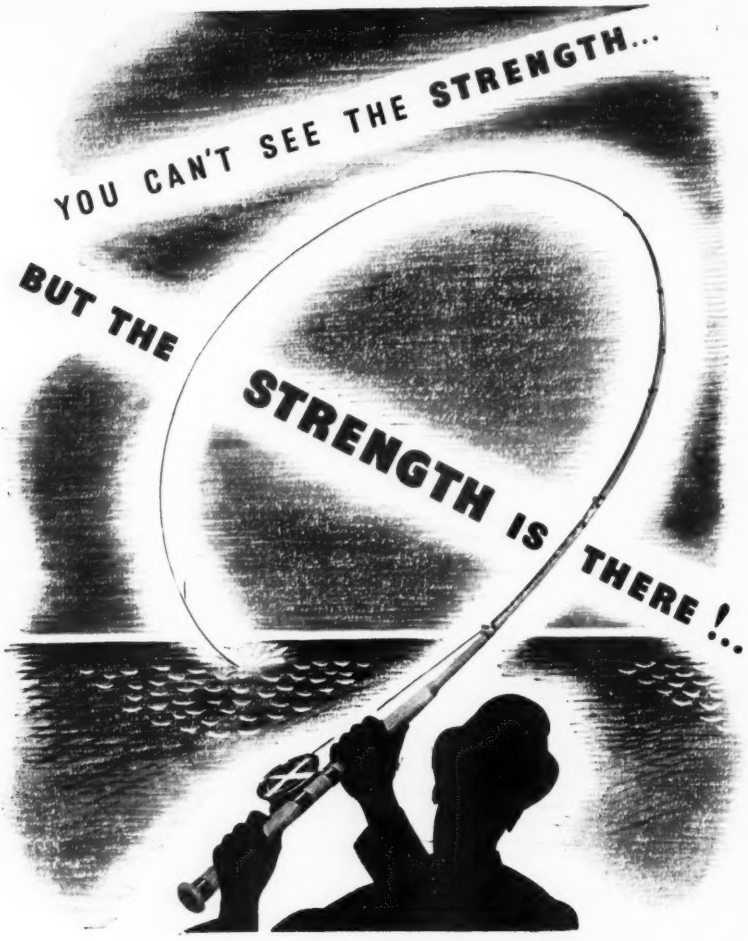

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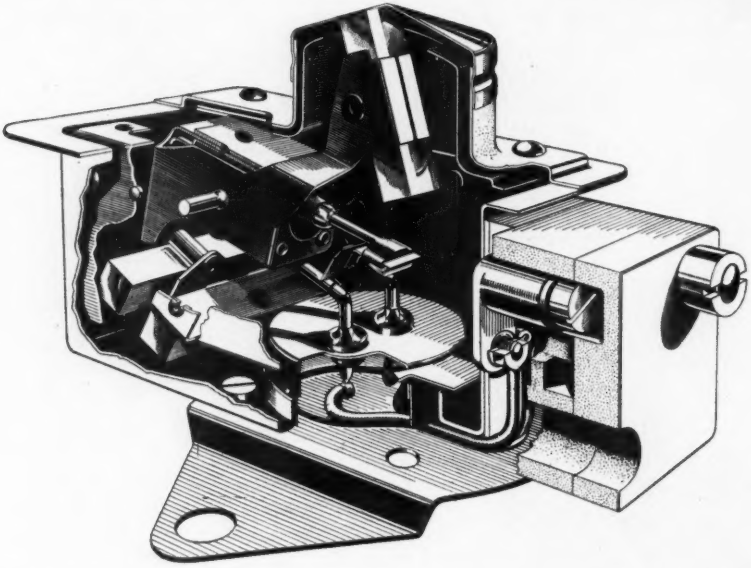

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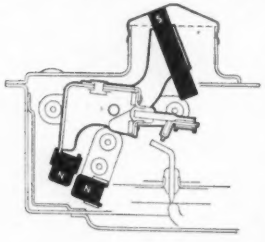
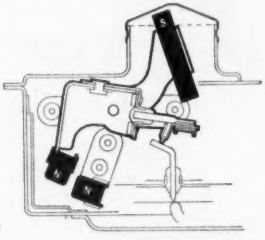


In the left illustration the top magnet on the beam assembly is attracted to the Curie cap, but its attraction ceases when a pre-determined temperature is reached, and the two bottom magnets swing the beam assembly to the position shown in the right hand illustration, completing an electrical circuit. When the temperature of the sensing element is reduced, the magnetic attraction between the Curie cap and the top magnet is restored, the beam is swung to its original position and the circuit is broken.



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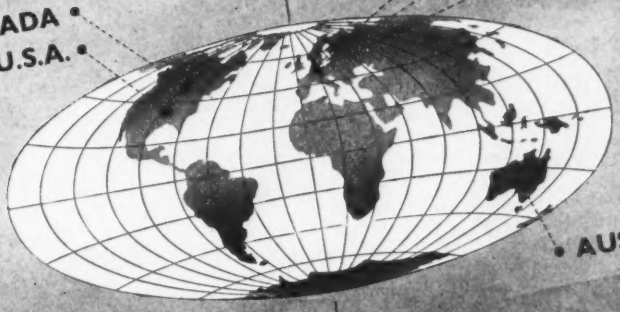

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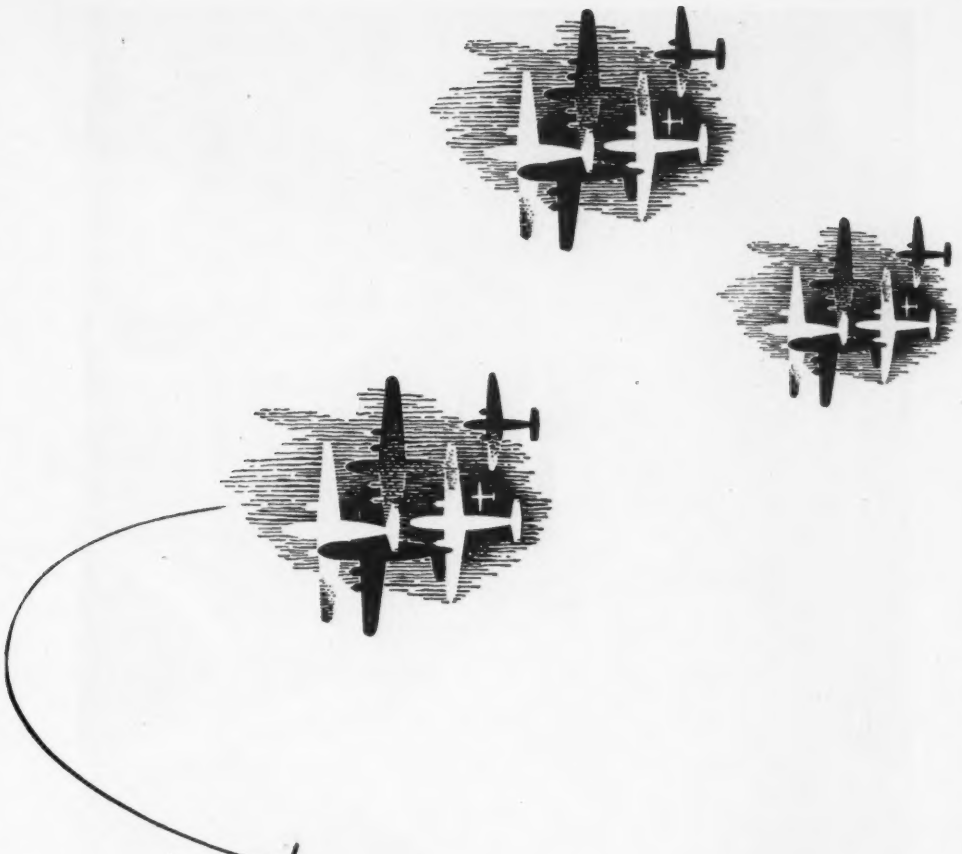

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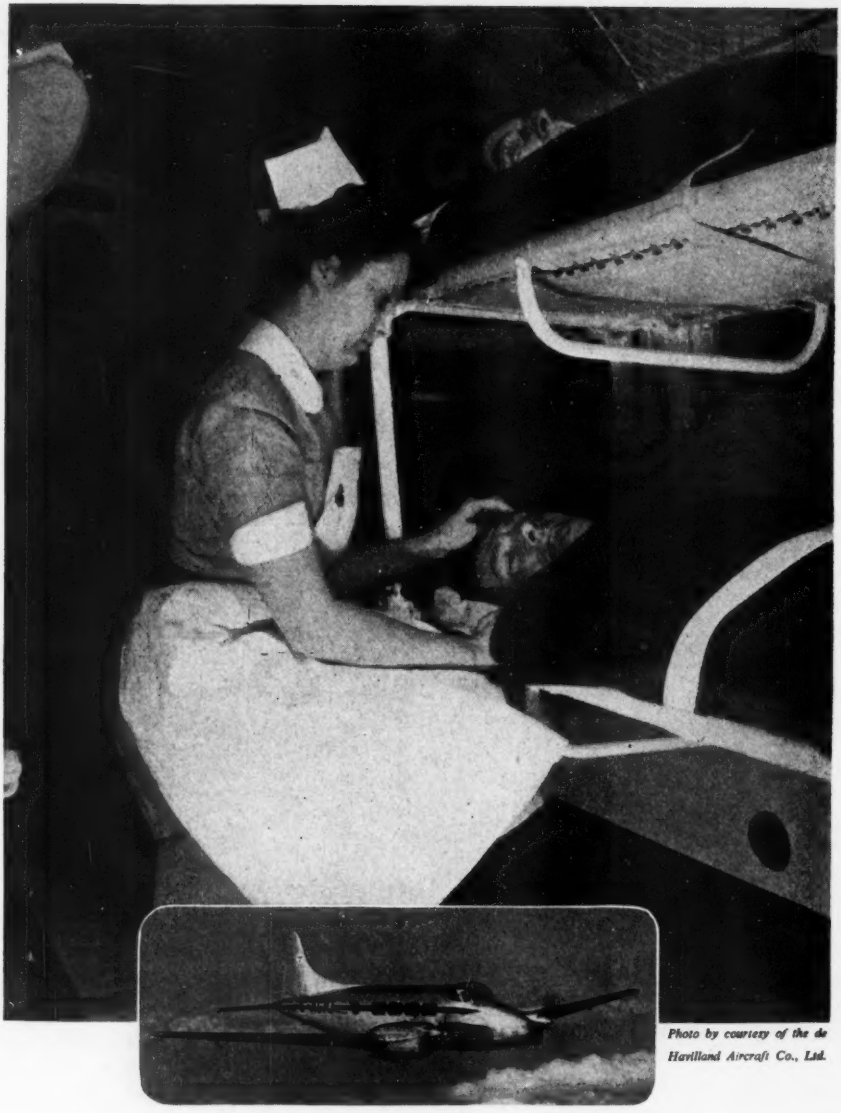

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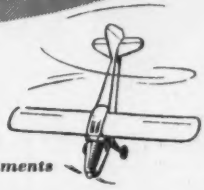

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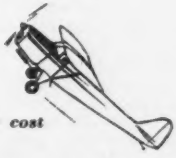

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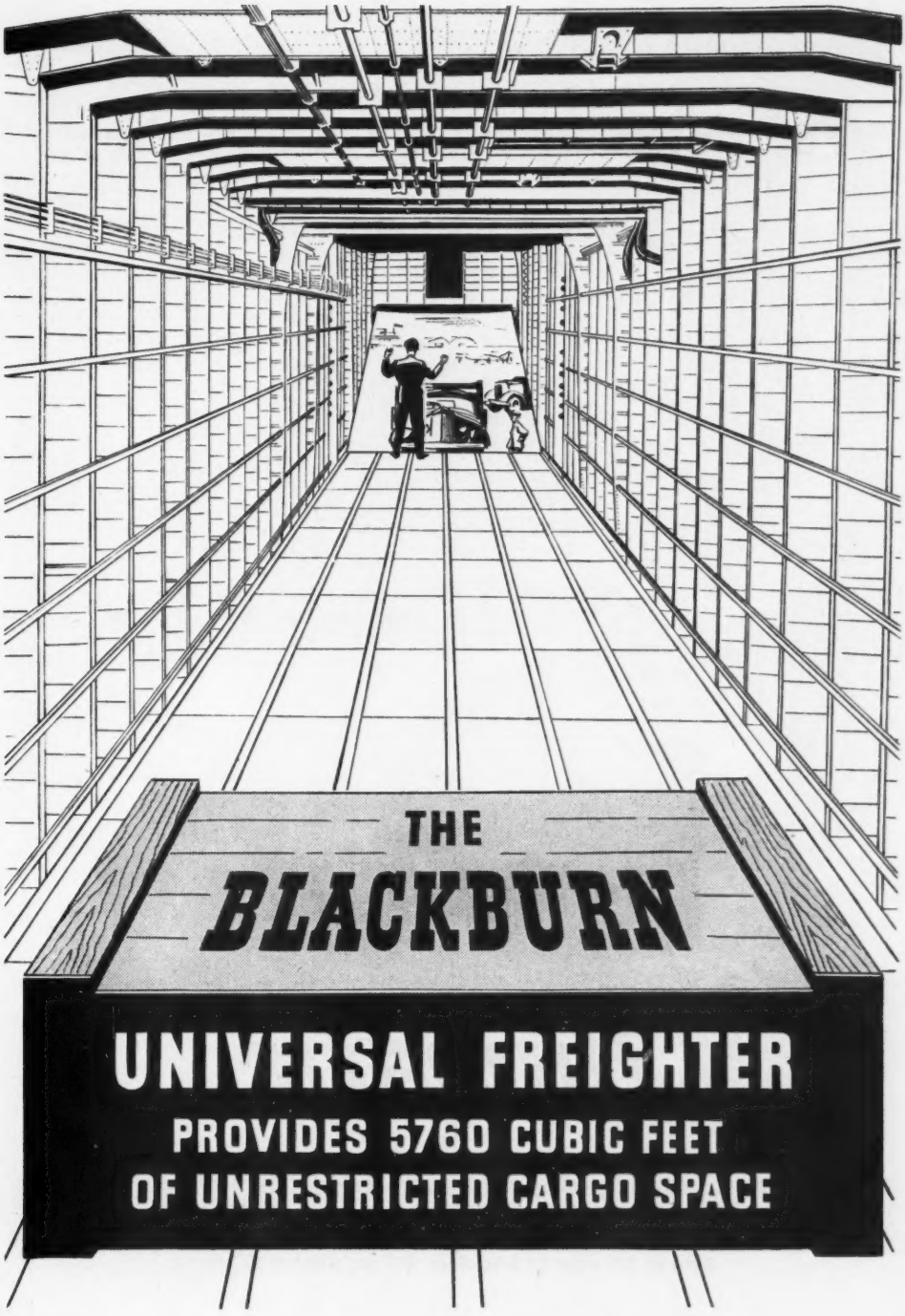
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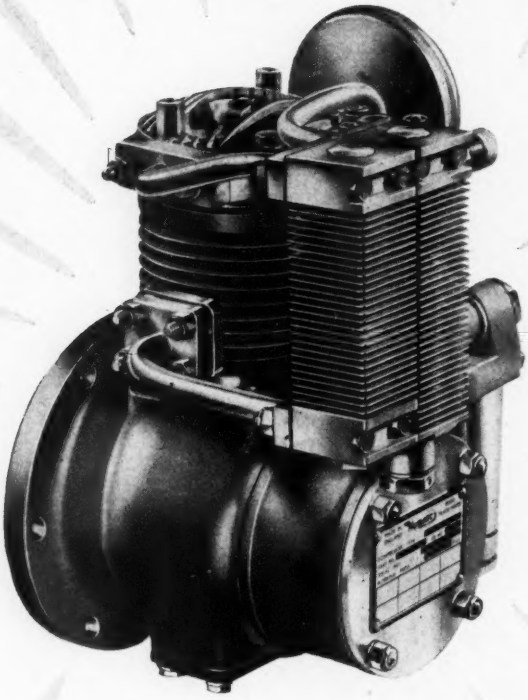

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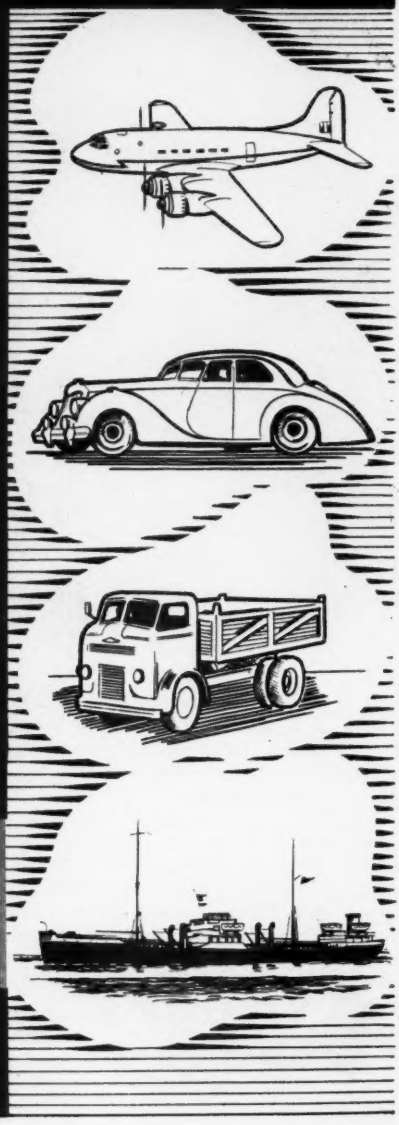

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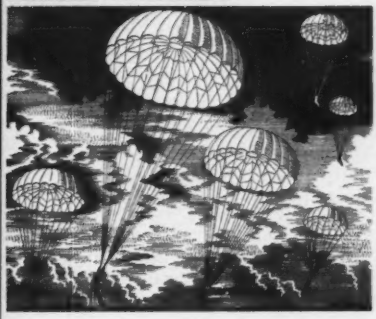

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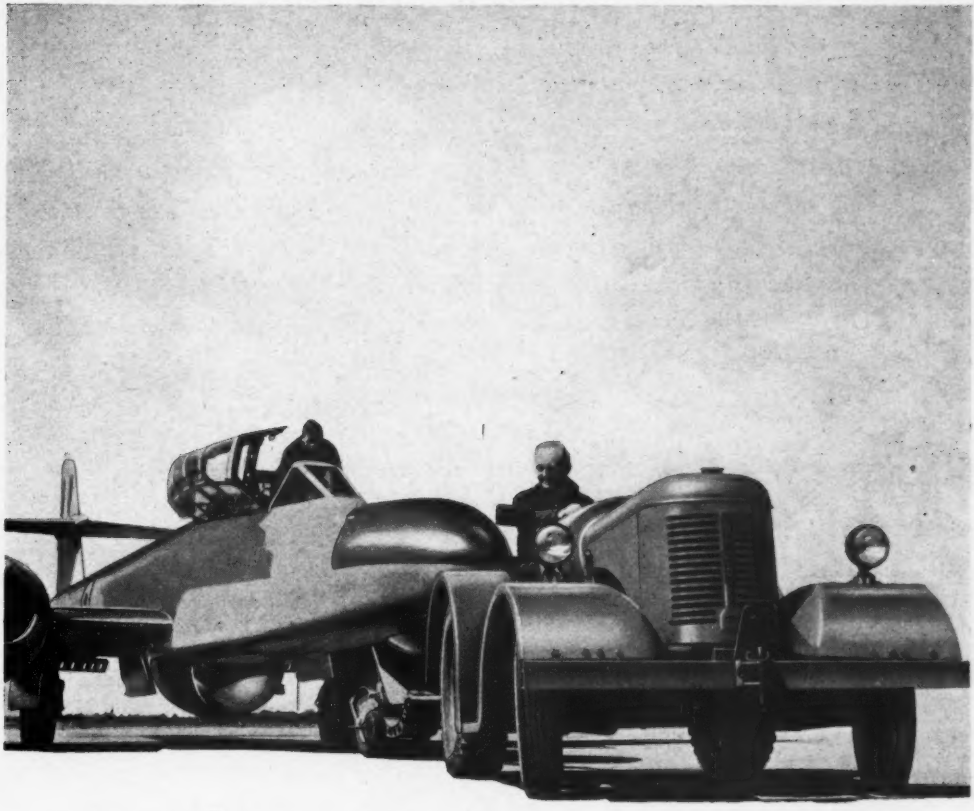

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Speculations Before Farnborough

WITH the organizers themselves still perplexed by late-hour fears and deferred decisions it would be idle to speculate too deeply on participation in the great Farnborough Display next week; but it is obvious enough that, among the aircraft at least, the real novelties will be almost exclusively military, or of a wholly experimental nature, with obvious military applications. This, of course, is as it should be, for Defence is the national watchword, and as yet we in Britain have hardly begun to harvest, as it were, our matchless crop of post-war civil types.

So far as can be seen at present (at this time of year, in deference to Security, we of *Flight* must pursue our business with one eye shut), there will be at Farnborough our first four-jet bombers (Vickers Valiant B.1 and Short S.A./4); first axial-jet intercepters (Hawker P.1067 and Supermarine Swift F.1); and, in the Hawker P.1072, our first fighter with liquid-rocket boost. All have been long awaited, and their performances—even mere presence—at Farnborough should do much to relieve the present anxieties.

But these fresh laurels are certainly not to be rested upon, for it cannot be said that the new types named have brought our technical development to a stage where equitable expansion of the flying Services is possible. It is true that vitally important carrier-borne anti-submarine machines and an excellent tactical bomber are in production, but on the other hand it is well to remember that no multi-jet all-weather fighter, ultra-long-range penetration fighter, ramp-launched rocket-powered intercepter, or jet-propelled carrier-borne strike aircraft has yet been seen, even in prototype form. Moreover, we are in need of new classes of helicopter for all three Services—particularly an anti-submarine type for the Navy—not to mention economical jet trainers on the lines of the Boulton Paul P.119 (announced in *Flight* last week), a new long-range pure-jet military transport and—we say it again—an up-to-date flying-boat for anti-submarine work and patrol from overseas bases. So long as these and other outstanding deficiencies are kept in mind, however, we may justly take pride in the new fighters and bombers already scheduled for presentation next week.

Other nations, of course, possess excellent fighters and jet bombers—and possess them in bigger numbers than we can at present contemplate; but this year's "Farnborough," we believe, will signal our leading position in one profoundly important field. We have in mind the team of four delta-wing research aircraft of Avro, Fairey and Boulton Paul, to which craft, and to their pilots, falls the weighty responsibility of securing for this country undisputed leadership in aerodynamic and structural design—a leadership commensurate with that we already hold in respect of turbine power.

Corporate Headway

OFTEN enough the two British Airways Corporations have been counselled to put their house in order, and at last it seems that the new brooms are hard at work. The 1950-51 annual reports and statements of accounts, recently published, show that a concerted effort has been made to tidy up and increase working efficiency in all the many departments which today make up such complex organizations.

On the credit side, it is instructive to observe the salutary effect of having nearly achieved the aim of "streamlined" fleets of suitable aircraft; and, of course, the equipment picture will continue to improve in a decisive manner with the introduction of the Comets and Ambassadors, and the Viscounts and Bristol 175s.

In their reports, the Corporations make commendably little of several legitimate complaints, but the fact remains that, had everything been just so for them in the period under review, the story of continued deficits might have been very different.

Examples of the factors which have increased the gradient of the uphill road to solvency—more particularly, perhaps, in the case of B.E.A.—are the relatively low rates paid by the Post Office for carriage of mail, the exceptionally heavy tax on petrol, and the M.C.A.'s high landing fees. Strikes, go-slows and late delivery of aircraft have also contributed materially on the negative side. But even allowing for the recurrence of apparently inevitable imponderables, the prospects have never looked brighter.

Short Bros. and Harland Ltd., S.A./4 bomber, powered with four Rolls-Royce Avon turbojets.

FARNBOROUGH STOP-PRESS

EVEN at this late hour rumour and counter-rumour are rife concerning the newest types of aircraft to be displayed and demonstrated at Farnborough next week; but that the Industry will not disappoint either our visitors from overseas or the expected multitudes of the British public will be evident from features in this special issue and from the list of "probables" appearing on this page.

As was expected, hardly had the review sections of this issue closed for press when new views of the latest types of aircraft cleared the tortuous channels of security. These very striking pictures are here presented, but that little of a factual nature can be said of the aircraft depicted is no surprise, in view of the stringent regulations now in force.

Heading this page is a dramatic impression of the Short S.A./4, second of our four-jet bombers and powered, like the first (Vickers-Armstrong's Valiant B.1), with four Rolls-Royce Avons. Below is a newly approved air-to-air study of the Vickers-Supermarine Swift F.1 intercepter fighter (one Avon), showing the striking plan-form and other details of this Type 535 development. Like the Valiant jet bomber and the Hawker P.1067 intercepter, the Swift has been ordered in quantity for R.A.F. re-equipment and expansion. Likewise powered with a single Avon, the beauteous Hawker P.1067—seen in the uppermost view on the opposite page—is a descendant of the original straight-wing P.1040, a type which itself is still in the news under the designation P.1072. This re-designation has been necessitated by the experimental installation of an Armstrong Siddeley Snarler liquid-fuel rocket motor, components of which are visible in the close-up internal view.

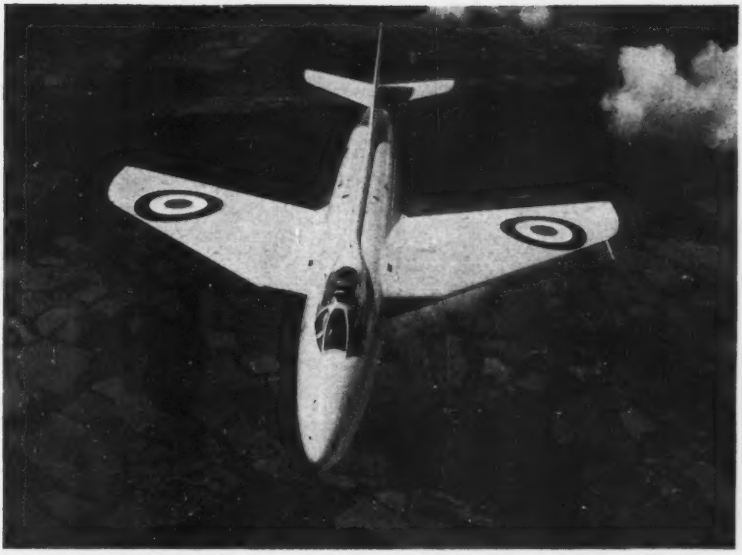
The projected Fairey Rotodyne (Armstrong Siddeley Mambas) will be displayed at Farnborough in model form.

Vickers-Supermarine Swift F.1 intercepter fighter, powered by a single Avon. Like the Hawker P.1067 depicted on the opposite page, the Swift has been ordered in quantity for the Royal Air Force.

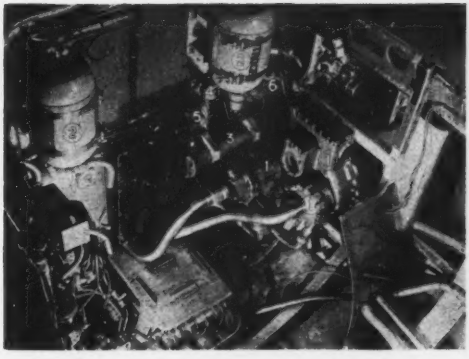
S.B.A.C. DISPLAY, 1951: PROVISIONAL LIST OF AIRCRAFT

Airspeed Ambassador (S)
Armstrong Whitworth (Gloster) Meteor N.F.11
Auster Aiglet Trainer
Auster Model (S)
Auster (type unstated) (S)
Avro 707
Avro 707A or B (S)
Avro Ashton 2
Avro Shackleton
Blackburn and General Aircraft G.A.L.60
Boulton Paul P.111
Bristol Brabazon I (S)
Bristol Type 173 (S)
Bristol Type 171
Bristol Proteus-Lincoln
de Havilland Chipmunk (S)
de Havilland Comet
de Havilland Dove
de Havilland Heron
de Havilland Sea Venom
de Havilland Vampire Trainer
de Havilland Venom (reheat)
English Electric Canberra P.R.3
English Electric Sapphire-Canberra
Fairey F.D.1 (S)
Fairey Firefly 7
Fairey Gannet
Gloster P.V. Meteor
Handley Page Hastings V.I.P. (S)
Handley Page Hermes V
Handley Page (Reading) Marathon I (S)
Handley Page (Reading) Mamba-Marathon
Hawker P.1052 (naval version)
Hawker P.1067
Hawker P.1072 (S)
Napier Nomad-Lincoln
Percival Provost
Percival Sea Prince
Percival Survey Prince (S)
R.F.D. Towed Winged Target (S)
Scottish Aviation Pioneer
Short S.A./4
Short Sealand
Vickers-Armstrongs Valiant
Vickers-Armstrongs Varsity (S)
Vickers-Armstrongs Viscount 700
Vickers-Supermarine Attacker (S)
Vickers-Supermarine Swift
Westland S-51
Westland Wyvern

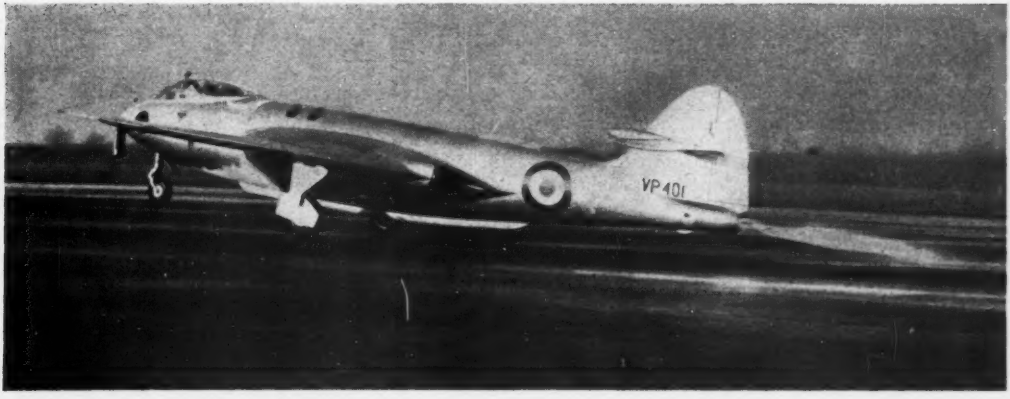
(The letter S in parenthesis denotes static display only)



Hawker P.1067 (Rolls-Royce Avon), showing the characteristic spine connecting the cockpit enclosure and the fin. Spotters will be quick to remark on the unusual size of the national markings on the swept wings of this shapely intercepter.



(Above) An impression of the Mamba-powered Fairey Rotodyne. (Right) Installation of the Snarler rocket motor in the Hawker P.1072. The numbered components are: (1) accessory gearbox and pumps; (2) nitrogen bottles (two); (3) air filter and drier; (4) nitrogen reducing valve; (5) pressure-operated switches; (6) solenoid-operated air valve. (Below) Take-off by the P.1072 (P.1040 development), powered with Armstrong Siddeley Snarler liquid-rocket motor and Rolls-Royce Nene turbojet.



FROM ALL QUARTERS

For Sapphire Production

AN important move to obtain production-capacity for the powerful Armstrong Siddeley Sapphire (7,200lb thrust) turbojet is revealed in the announcement, made by the Hawker Siddeley Group last Friday, that three-quarters of the vast "pre-fab" factory at Hucclecote, Gloucester, is to be turned over to the manufacture of these units. For several years past, under the management of Hawksley Constructions, another member of the Group, this works has been turning out large quantities of pre-fabricated houses for Britain and the Commonwealth.

A new company has been formed to operate the production line: its title is Brockworth Engineering, Ltd., and the directors are Sir Frank Spriggs (chairman), Mr. Hugh Burroughes, Mr. H. T. Chapman and Mr. W. F. Saxton. One of the problems with which they will have to contend is to find the necessary number of machine tools; the first, however, are already installed and in operation. Many of the Hawksley workers will be trained in the new job as tools become available.

The Sapphire is already in production for the R.A.F. at its makers' Coventry works, and it is being built under licence for the American Air Forces by Curtiss-Wright in New Jersey and Buick (General Motors) in Detroit.

Avon-Sabres for R.A.F.?

A PROPOSAL to power 500 American-built F-86 Sabres with British-built Rolls-Royce Avons is still far from dead, according to *Aviation Week*. "Some Pentagon sources say," that journal adds, "that if the engines could be supplied as fast as the airframes, the problem would be simple of solution." With spares, according to the U.S. tables of supply, four or five power units would have to be supplied for each airframe.

The Skyrocket's Climb—Official

THE United States Navy officially announced in New York last week that the Douglas Skyrocket had exceeded the world's absolute altitude record of 72,394 ft established by Capts. Orvil Anderson and Albert Stevens in a balloon in 1935. On the climb a speed of about 1,000 m.p.h. was achieved. Launched from a bomber flying at 35,000 ft. the Skyrocket is said to have "broken through the sonic barrier" within ten seconds. The pilot was Major Bill Bridgeman.

Greenland Adventure

FOUR naval officers who have spent an arduous month of exploration in a remote part of Greenland, where they were put down by a Coastal Command Sunderland in July, were picked up by another Sunderland on August 29th and flown back to Pembroke Dock. The rendezvous was at Seal Lake, on the north-east Greenland coast, and the flight was made in the face of strong head-winds and very poor visibility.

The party has been engaged on a preliminary scientific survey which will be followed by a full-scale expedition next year. The four officers were Cdr. C. J. W. Simpson, R.N., Lt. F. R. Brooke, R.N., Lt. A. Ernskie, R.N., and Capt. M. E. B. Banks, R.M.

Also on board the Sunderland for the return trip were W/C. Charles Gardner of the B.B.C. and a Danish trapper (to act as dog expert during next year's expedition), who was taken as far as Iceland. The pilot was W/C. George Barrett, A.F.C.

Naval Display

THAT some of the more spectacular items scheduled for the Royal Naval flying display at Lee-on-Solent (a joint effort by R.N.A.S., Gosport, and R.N.A.S., Lee-on-Solent) were cancelled will come as no surprise to anyone who endured the teeming rain on the South Coast last Saturday afternoon. With real naval tenacity, however, the organizers made the very best of the gloomy situation and won the praise of those who braved the weather, including Lord Pakenham, First Lord of the Admiralty, and Vice-Admiral C. E. Lambe, C.B., C.V.O., Flag Officer (Air) Home. A first-rate static show of aircraft, equipment and photographs were recompense for unavoidable deficiencies in the flying programme.

Seafires of No. 1832 Squadron, R.N.V.R., and a helicopter item wherein the capacious Westland-Sikorsky S-55 (pilot, Mr. K. Reed) made its first appearance at a Royal Naval display, illustrated widely differing naval-flying techniques, and a nautical atmosphere was maintained by a stream take-off and landing by Hawker Sea Furies and Blackburn Firebrands of No. 1 Carrier Air Group. The occasion was graced by the matchless aerobatics of the Patrouille d'Etampes and by the gliding of Miss Joan Downes, a V.A.D. worker at the Royal Naval Medical School.

The Percival Pembroke

ANNOUNCEMENT of the introduction of the Percival Prince into the Royal Air Force, where it will be known as the Pembroke, comes as a fitting prelude to the Percival participation in the S.B.A.C. Display. The makers view with natural pride their achievement of having two separate designs accepted for the Royal Air Force within a year—for the news of the Pembroke follows on the acceptance of the P.56 Provost basic trainer, announced in February.

The Pembroke will fly at an increased all-up weight and will be suitable for world-wide employment by day or night. In the first instance, it will be employed for communications, freighting, long-range ferrying and casualty evacuation, replacing existing aircraft which have been performing similar functions. Apart from the rôles mentioned above, however, it may be operated in other capacities associated with various forms of Service training.

New Director of Iliffe and Sons Ltd.

FOLLOWING the recent death of G. Geoffrey Smith, Arthur B. Bourne has been appointed a director of Iliffe and Sons, Ltd., proprietors of *Flight*. Mr. Bourne has been with the firm since 1926, and has been editor of *The Motor Cycle* for the past twenty-three years. Before joining Iliffe's, he was engineer to the Auto-Cycle Union, a post which called for considerable knowledge, both practical and theoretical, of internal-combustion engineering. It also, incidentally, brought him into early contact with aviation, for he acted as official engine-measurer at one of the two light 'plane competitions held at Lympne in the early twenties.

An enthusiastic motor cyclist and car owner, Mr. Bourne makes motoring his principal hobby, with trout-fishing a close second.

Motor cyclists among our readers may be interested to hear that H. W. Louis, assistant editor of *The Motor Cycle*, succeeds to the editorship of that journal.

A.B.A.C. Informality

AS if to make amends for its ungracious behaviour at last year's gathering, the weather for the A.B.A.C.'s Annual Convention last Sunday was good. About 50 visiting aircraft and a number of cars accordingly dropped in at White Waltham during the afternoon, bringing some 200 club members and their friends for an informal drink or a cup of tea. Apart from an arrival competition —which, incidentally, was won by Mr. D. Wickens of Fairoaks— the afternoon was innocent of displays or organized items of any kind. In addition to talking shop, visitors found casual diversion in watching the antics of some R.A.F. gliding enthusiasts who chose, every ten minutes, to graze the roof of the clubhouse before landing on the field some 100 yards in front of it.

The "spare-time aeronauts" were particularly glad to welcome A.V.-M. J. D. I. Hardman, C.B., O.B.E., D.F.C., Acting C-in-C. of Home Command, who was to be seen chatting interestedly with several groups during the afternoon. Home Command, whose H.Q. are at White Waltham, have a strong link with the club movement in that they are responsible for administration of the scheme whereby A.T.C. cadets are trained to Private Licence standard.

H.P. 88 Inquiry

AN inquest was held at Stansted, Essex, on August 30th on Mr. D. J. P. Broomfield, the pilot of the H.P. 88 research aircraft which, as reported last week, crashed at Stansted on August 26th.

Mr. B. A. Morris, senior investigating officer to the Accident Investigation Branch of the M.C.A., is reported as saying that he found that a failure of the construction of the aircraft had occurred, causing it to crash. He added that he was satisfied that the machine was airworthy before the flight.

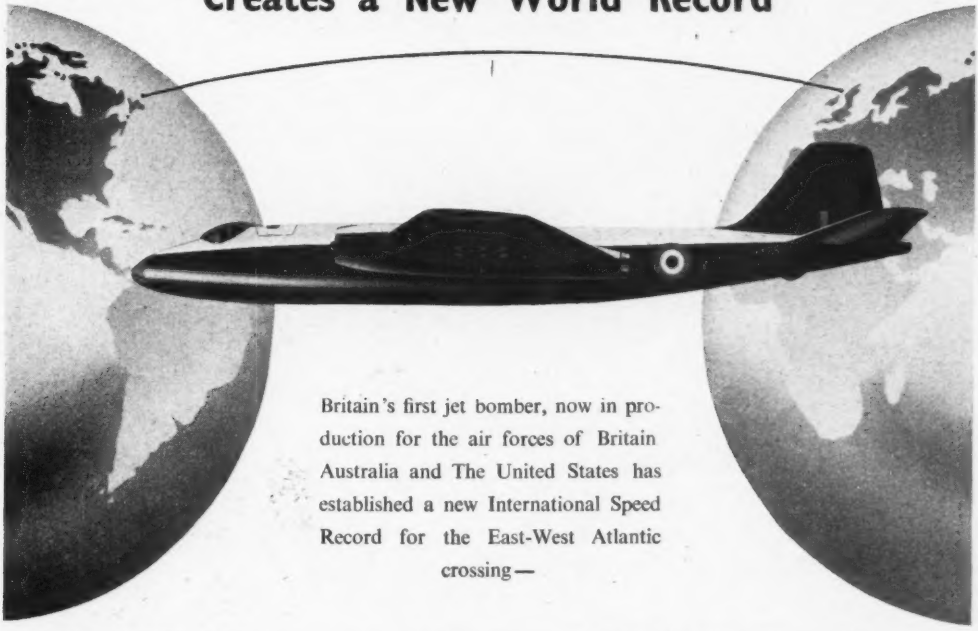
Mr. Kenneth Lyon, Handley Page development engineer, said the last message from Mr. Broomfield was a request to Stansted tower to fly down the main runway at a height of 300 ft. This was granted, and the permission acknowledged by the pilot. The H.P. 88 was making the run when it broke up. When Mr. Lyon reached the wreckage the pilot was dead in his seat.

The front part of the fuselage was separated and the seat had become detached from the cockpit. "It is my opinion," said Mr. Lyon, "that the forces exerted on the pilot at the time of the break-up, prevented him attempting to operate the ejector seat." The undercarriage was retracted at the time of the accident.

Mr. Geoffrey Brown, a local farmer, said the aircraft passed over him. The nose went up, then the machine levelled off and rose steeply once more. The right wing appeared to come off, the aircraft turned, and the left wing broke away.

The 'ENGLISH ELECTRIC' CANBERRA

Creates a New World Record



Britain's first jet bomber, now in production for the air forces of Britain Australia and The United States has established a new International Speed Record for the East-West Atlantic crossing—

ALDERGROVE, Northern Ireland, to GANDER, Newfoundland, in 4 hrs. 19 mins.

(Subject to official confirmation)

The 'ENGLISH ELECTRIC' Canberra is powered by two Rolls-Royce Avon jet engines

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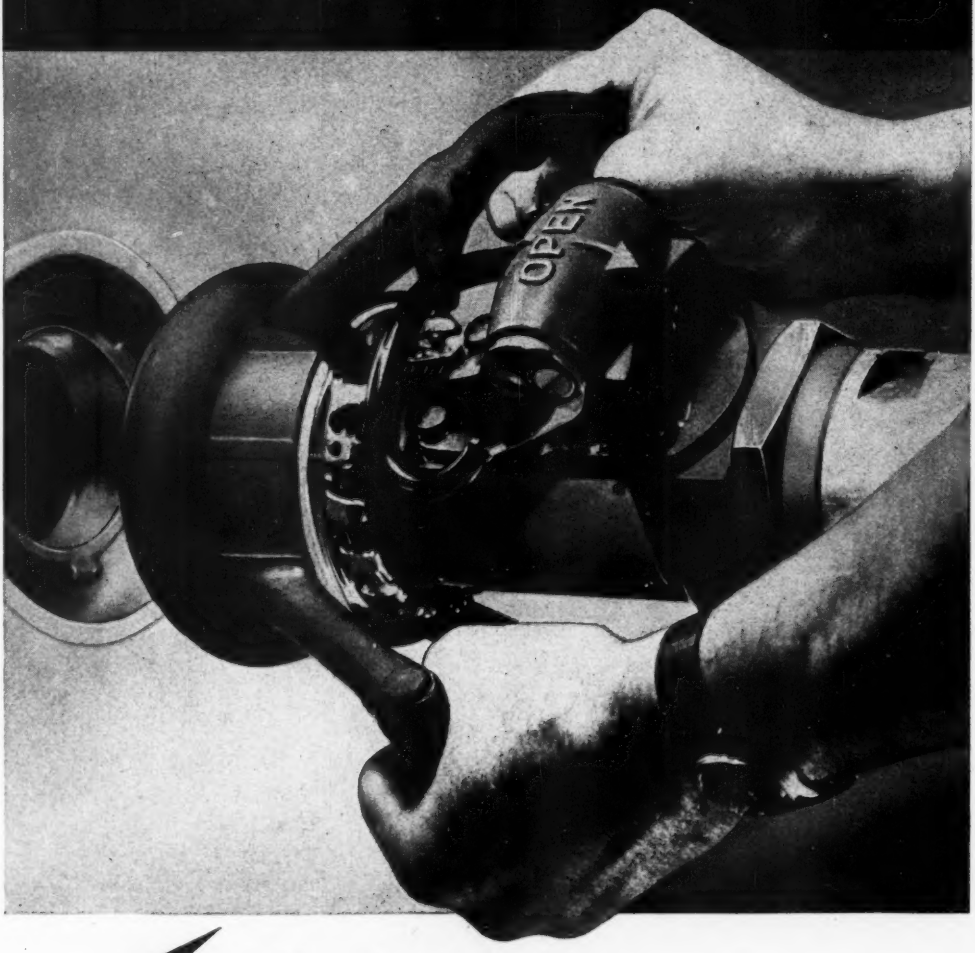

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40,000ft in THREE MINUTES

Climb Records Established by Sapphire-Meteor

ON Friday evening, August 31st, a modified Meteor 8 powered with Sapphire ASSa2 turbojets established four time-to-height records by climbing to 12,000 metres (39,372ft) in the very short space of time of 3 min 7 sec. This achievement is all the more remarkable in that the time was registered from the moment that the pilot released the wheel brakes; it is thus a time-to-height-from-standing-start record.

The pilot of the aircraft was F/L. R. B. Prickett, of Armstrong Siddeleys, and the flight was made from Moreton Valence so that Prickett could climb over the Severn Estuary and thereby obtain a sea-level datum for the continuous measurement of his instantaneous height by radar altimeter. The instrument used was a unit especially modified for the purpose by the Royal Aircraft Establishment, and the installation and timing arrangements were officially scrutinised and sealed by observers from the Royal Aero Club, representing the Fédération Aéronautique Internationale.

From take-off, Prickett held the aircraft down to about 200ft for approximately two-and-a-half miles, whilst building up speed to 470 kt indicated. He then let the nose lift to an initial angle of about 17 deg, thence progressively steepening the angle of climb whilst maintaining the air-speed constant. At about 20,000ft, he turned attention from the A.S.I. to the Machmeter, keeping the aircraft at MO.78; his angle of climb at 40,000ft he estimated to be about 45 deg.

The four records concerned are time-to-height from rest to 3,000, 6,000, 9,000 and 12,000 metres, and the Meteor's times for these were :—

3,000 metres (9,843ft)	.. ..	1 min 16 sec
6,000 ,, (19,686ft)	.. ..	1 min 50 sec
9,000 ,, (29,529ft)	.. ..	2 min 25 sec
12,000 ,, (39,372ft)	.. ..	3 min 7 sec

These figures give equivalent rates of climb of 7,760, 10,740, 12,215 and 12,630ft/min, the last being, of course, the average for the maximum record height. What is, perhaps, of greater interest, however, is that the average rate of climb from 10,000ft to 40,000ft was roughly 16,000ft/min.

Armstrong Siddeley test pilot "Tom" Prickett had the benefit of a pressure cabin, and thus wore ordinary clothes

CANBERRA'S NEWEST TRIUMPH

UNDER the official surveillance of the Royal Aero Club, acting for the Fédération Aéronautique Internationale, an English Electric Canberra B.2 tactical bomber (two Rolls-Royce Avon turbojets) crossed the Atlantic from Aldergrove, Northern Ireland, to Gander, Newfoundland, in 4 hr 18 min 29.4 sec, on August 31st, thereby establishing, subject to confirmation, a new record for the transatlantic trip. The previous fastest time of 4 hr 37 min was set up by a similar Canberra piloted by S/L. A. E. Callard, D.F.C., on February 21st this year.

Manning the Canberra on this latest enterprise were W/C. R. P. Beamont, D.S.O. and Bar, D.F.C. and Bar (chief test pilot of the English Electric Co. since 1947), Mr. D. A. Watson (navigator) and Mr. R. H. T. Rylands (wireless operator). Mr. Rylands is a member of the Marconi staff.

Before take-off Beamont had predicted that he would lower Callard's time by 15-20 minutes, and the accuracy of his forecast is a remarkable tribute to the care of the flight planning and to Mr. Watson's navigational skill. From the start to the finishing line—marked by two ships on the lake 13.9 miles west of Gander—the Canberra covered 2,072.79 statute miles at an average speed of 480 m.p.h. The start was signalled by Mr. F. A. Dismore of the R.Ae.C. at 12.23 G.M.T. Beamont held the Canberra on the brakes and at the drop of the flag the grey and black bomber surged forward and nosed swiftly into the clouds.

Signals during the first hour told of an average speed of 520 m.p.h., and in 2 hr 7 min 1,065 miles had been covered at 503 m.p.h. Thereafter the rate of progress was slower, and that this slackening was due to headwinds was confirmed by Beamont after landing. In the early stages, he reported, the winds were of some 20 knots force, later rising to as high as 80 knots.

The Canberra was making a delivery flight to the Glenn L. Martin Company, of Baltimore, where, under the designation B-57, a Sapphire-powered night-intruder version is to be produced in quantity for the U.S.A.F.

The following message was passed by Mr. Arthur Henderson, Secretary of State for Air, to W/C. Beamont at Gander: "Hearty congratulations to you and your crew on your record-breaking transatlantic flight. This again demonstrates the high quality of the Canberra and of British airmanship." With which sentiments all will concur.

"BEA" AND HIS BOYS: At Aldergrove, chatting with the station commander, G/C. D. J. Coote, before the Canberra's record transatlantic flight, reported on this page, are (l. to r.): Mr. D. A. Watson (navigator), W/C. R. P. Beamont (pilot), and Mr. R. H. T. Rylands (radio operator)

NOT TO BE MISSED . . .

THE pre-opening days of Farnborough Show week—the Saturday, Sunday and Monday, when the aircraft are arriving in the "static park"—have never failed to bring surprises: always there is the new machine or new equipment even the existence of which has been security-veiled up to the very last moment.

The highlights of these three busy days, and of Tuesday, the pre-view day, when technicians and the Press see the full programme of both exhibition and flying display—will be fully described and illustrated in next week's issue of FLIGHT, dated September 14th, and this number will be on sale during the Show period.

The following week (September 21st) we shall describe the flying display on both the "industry" and public days.

CIVIL AVIATION

THE COMET VISITS CALCUTTA

A RECEPTION party 2,000 strong greeted the B.O.A.C. Comet on its arrival at Karachi last Friday after (subject to official confirmation) it had broken the record for the flight from London by some 3 hr 10 min. The pilot was Capt. A. Majendie. The record was previously held by S/L. Neville Duke in a Hawker Fury.

The elapsed time for the Comet's 4,525-mile flight from London was 12 hr 13 min, including a 92-min stop at Cairo. On Saturday the machine flew on to Ahmedabad and in the afternoon reached Delhi, a distance of 800 miles in 100 min. On Sunday it was scheduled to visit Allahabad (the alternative to Delhi) and also Calcutta. The aircraft was due to return to Karachi on Monday, and on Tuesday was scheduled to leave on its return flight to London *via* Karachi, Basra, Cairo and Rome. When it reaches London Airport this machine will have completed about 75,000 miles of development flying in the hands of B.O.A.C. One of the purposes of the Calcutta flight was to test the standards of ground facilities and available runway lengths at airports which Comets are likely to use in service.

We learn, incidentally, that work is now well in hand on the Avon-powered versions and that the first machine should fly this year. Also, B.O.A.C. may shortly take delivery of their first Comet (the one being used on development flights is on loan). As three machines should have been delivered by December, it seems likely that regular services will be introduced in the early part of the new year.

THE BRABAZON AT PRESTWICK

THE visit of the Brabazon I to Prestwick on August 28th apparently created, what was an unprecedented amount of public interest for an event of this nature. Several thousands of spectators braved heavy rainstorms to watch its arrival from the main gates of the airport. Having flown direct to Prestwick from Filton, covering the 380 miles in about 1 hr 23 min, the Brabazon landed with no apparent difficulty on the 300ft-wide runway in a crosswind of 25 kt. A series of demonstration flights on the Wednesday, when a number of Scottish V.I.P.s were to have been carried, had to be cancelled because of weather, but later in the afternoon it was found possible to fly over the lower estuary of the Clyde. The Secretary for State for Scotland, Mr. Hector McNeil, was among the passengers.

After landing in a cross-wind which was gusting up to 28 kt, "Bill" Pegg, who was piloting, said that although he was perfectly comfortable, he would have been happier taking-off into wind. Locally this was taken to mean that he agreed with the opinions of B.O.A.C. and the Scottish Advisory Council that a new secondary runway is essential for Prestwick if the successors of the Brabazon are to make regular calls there when they eventually go into service on transatlantic services.

Incidentally, we learn from Bristol that the 4½-hr flight, recently referred to as being the longest the Brab had made, was actually the longest "passenger-carrying" flight. On test it was airborne for 9¾ hr on August 17th, when it flew to the Orkneys and back.

ELIZABETHANS ON THE PARIS RUN

HOW much better late than never was left to be judged by a full complement of passengers on the final proving night to Paris last Saturday of B.E.A.'s Elizabethan flagship. Lord and Lady Douglas, Mr. and Mrs. Peter Masefield, and others of B.E.A. were the hosts to senior officials of the Ministries and manufacturing companies (Airspeed and Bristol), including Sir George Cribbett, deputy-secretary, M.C.A., and Mr. S. Scott-Hall, Director-General of Technical Development, at the Ministry of Supply.

The night, made mainly in heavy rain, went according to plan. The take-off weight with 48 passengers, captain, first officer/navigator, radio operator, steward and stewardess, was 51,500 lb (1,000 lb under the maximum), and the outward flight plan, for example, called for an on-track climb to 15,500ft in about 20 minutes, by which time the coast had been reached. A short period of cruising at about 250 m.p.h. was followed by a let-down to Le Bourget. Chock-to-chock time was 1 hr 20 min.

On Monday, September 3rd, an Elizabethan started in general service, and on October 21st scheduled services will commence with this type. Comfort is of a high order, and the large, air-conditioned cabin is tastefully furnished with three seats to port and two to starboard of the aisle.

ASSOCIATES FOR AER LINGUS?

IN a statement published last week the British Independent Air Transport Association expressed its concern at the difficulties now experienced by travellers to Ireland from this country. They say that the capacity of both surface and air transport facilities has proved inadequate to meet the demand, and that frequency of existing services must be increased if unimpeded communications are to be maintained.

B.I.A.T.A. has therefore suggested to the Minister of the Eire Department of Industry and Commerce that Aer Lingus should be encouraged to adopt an arrangement similar to that now operated by B.E.A., under which independent operators run associated services on those routes which the Corporation is unable, or does not wish, to provide further capacity. This, maintains the Association, would enable many more people to take advantage of air travel. It is thought that, if a similar scheme were adopted by Aer Lingus, the larger companies could provide additional flights to meet the substantial demand for air transport to Dublin from such towns as Cardiff, Leeds, Newcastle and Blackpool, in addition to those in Scotland.

THE CORPORATIONS' YEAR OF PROGRESS

THE annual reports of the two Corporations have deservedly been well received, reflecting as they do a considerable all-round improvement in results achieved in the face of a number of difficulties beyond the control of their managements. Last week we published preliminary summaries of the financial statements; this week some enlargement follows under the main headings contained in the extensive printed reports.

British European Airways Corporation.—In last week's financial summary, the improved overall result for B.E.A.—a reduction in losses of 28.2 per cent—£979,267 for 1950-51 as compared with £1,363,594 for the previous year—was recorded. In round figures, just under a million passengers were carried, together with over 10,000 tons of freight and 5,250 tons of mail.

From April, 1950, to the end of November, 1950, the first eight months of the financial year, the Corporation in fact achieved a small profit; the whole of the loss was incurred during the four winter months December to March. The load factor achieved for the year was 58 per cent, or very near to the factor of 63 per cent which was required to break-even on operating costs.

The year ended with the Corporation short of both aircraft and crews in spite of the purchase of four Vikings and of twelve C-47s for rebuilding as Pionairs. The situation was aggravated by the delays in the delivery of the Elizabethan class (Ambassador) aircraft. Utilization of Vikings throughout the summer was at the rate of more than 2,200 hours per annum, and of Dakotas 2,000 hours per annum, and it is thought that on the short-haul routes it will be difficult to improve upon these figures. They represent a 25 per cent increase in the average annual rate.

On the subject of new services, the report states that the most important expansion during the year was the opening of the stopping route to Cairo from London by way of Nice, Rome, Malta, Tripoli and Benghazi, linked with shuttle operations to Sicily and Tunis. Connection is made with B.O.A.C.'s West African services at Tripoli. Early in the year B.E.A. withdrew from the London-Lisbon service, handing it over to B.O.A.C. on June 2nd. This service is a very profitable one and to relinquish it cost B.E.A. some £25,000 for the year. A London-Barcelona service was opened on October 22nd; it has proved a success and is now operating to a frequency of five services a week. A London-Milan service was also inaugurated, with good results.

A new high frequency of twelve scheduled services a day on the Paris route was achieved, and during the summer months fifteen services a day were operated in both directions. In spite of the high revenue earned on the Paris route results are not yet satisfactory. For a number of reasons, some of which are listed below, such a short-stage route incurs high operational costs. A substantial expansion of the services in Germany was undertaken early in 1951.

The report states that one of the most encouraging aspects of the expansion of the Corporation's business has been the development of freight traffic, and B.E.A.'s six Dakota freighters have been kept hard at work. Big developments are foreseen.

Regarding B.E.A.'s British internal services, the following factors are given as adversely affecting economy: (1) The requirement to operate socially essential routes on which poor traffic was offering; (2) the very short distances to be flown (average stage 118 miles); (3) fuel tax; (4) mail rates at some 28.6 per cent

HAWKER SIDDELEY GROUP

A full quiver for freedom's defence

For the third time in their history, the principal companies of the Hawker Siddeley Group are again engaged in all-out, large scale production . . . their current aircraft covering every military requirement . . . their entire resources devoted to development of new aircraft and aero engines . . . their leadership unchallenged.

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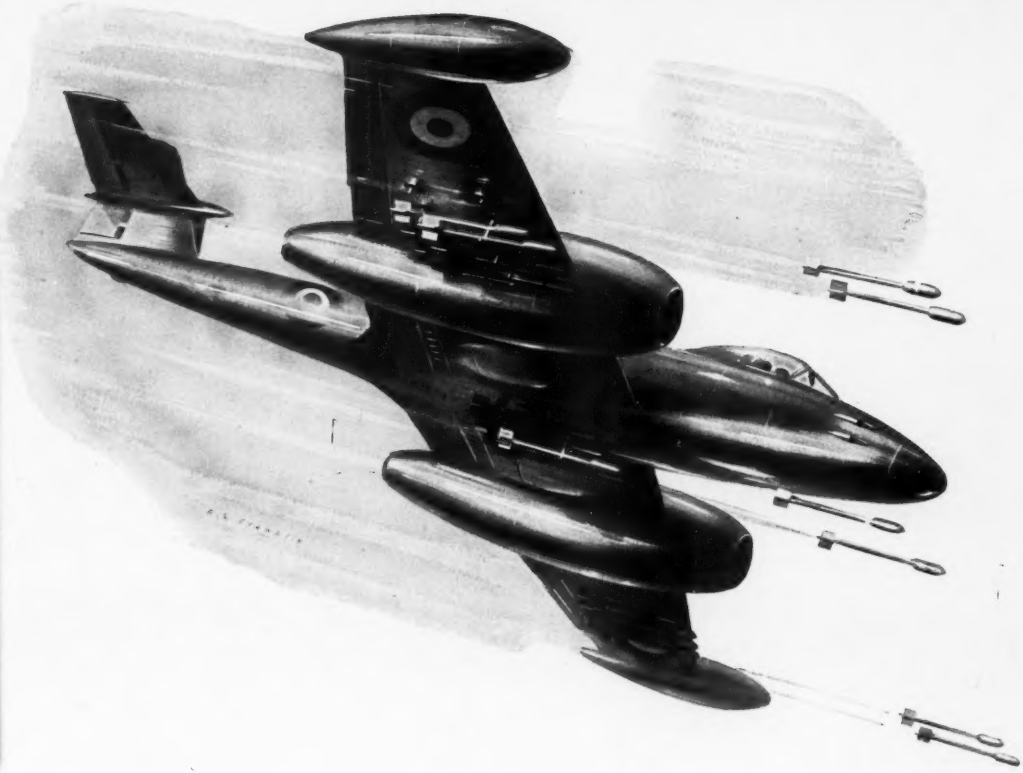
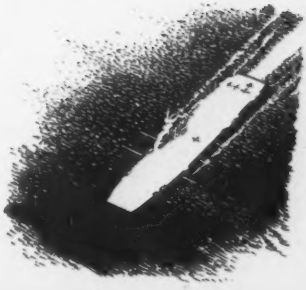


In the short ten years since Britain's first jet aircraft — the Gloster Whittle E 28/39 — made its historic flight, Glosters have produced and developed the Meteor — most versatile of jet fighters and today the spearhead of Western Union Defence. This all-purpose fighter has also been developed as a two-seat trainer and for photo-reconnaissance and now as a new long-range P.V. Meteor for tactical ground attack.

GLOSTER *Meteor*

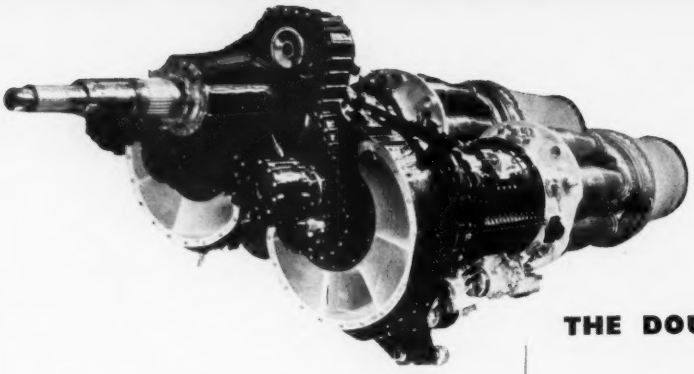
At home Naval Squadrons are re-equipping with Sea Hawks — the first of the new Hawker range of jet fighters — while in Korean waters Sea Furies operate with units of the Far Eastern Fleet. Now the P 1067, the best fighting aircraft flying anywhere in the world today, is going into immediate quantity production for the Royal Air Force.



HAWKER *Sea Hawk*

FOR FREEDOM'S DEFENCE

. . . A FULL QUIVER



THE DOUBLE MAMBA

turboprop

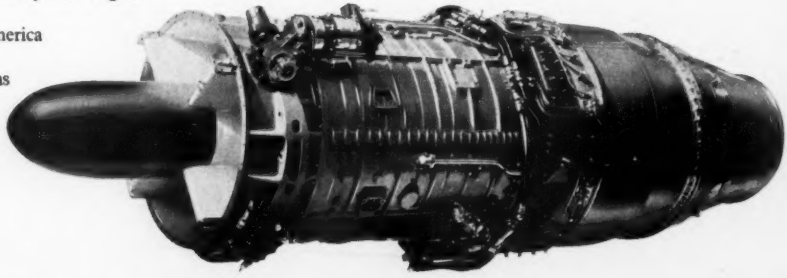
a true double engine and not a coupled pair—is in quantity production for the first of the Navy's anti-submarine aircraft.

For a weight of 2,050 lb. it gives 2,800 e.s.h.p.

THE SAPPHIRE

turbojet

developed by Armstrong Siddeley—is being made in quantity in Great Britain and also by the Wright Aeronautical Corporation in America under licence agreements. It has been type tested at 7,200 lb. thrust and weighs 2,500 lb.



of the

ARMSTRONG SIDDELEY *Gas Turbines*

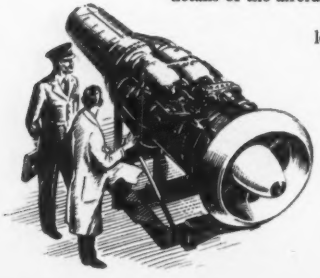
FOR FREEDOM'S DEFENCE

Taking its place as the standard all-weather night fighter for the R.A.F., Western Union Defence and N.A.T.O., the A.W. Meteor N.F. 11 is now in quantity production at the works of Sir W. G. Armstrong Whitworth Aircraft Ltd. where extensive re-design of the basic Meteor was carried out. Performance details are still secret, but its high rate of roll and short landing approach will be appreciated by the pilots of this far-reaching, powerful night fighter.

ARMSTRONG WHITWORTH *Meteor NF11*

. . . A FULL QUIVER

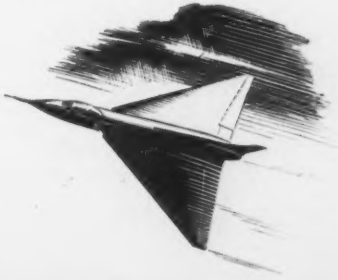
Four years ago Avro Canada's jet fighter, the CF-100, was but a drawing board project, to-day the first production models are starting to move down the initial production line setting the pattern for future delivery schedules to the Royal Canadian Air Force. This day and night fighter is powered by two Orenda turbo-jets—also designed and developed by Avro Canada. Performance details of the aircraft may not be disclosed, but it has an exceptional rate of climb with unusually long range. The Orenda is one of the biggest gas turbines in the world. It delivers a rated thrust of more than 6,000 lb. with a low fuel consumption of about one pound per hour per pound thrust. It is backed by over 5,000 hrs. of bench-testing and 150 hrs. of flying.



AVRO CANADA *CF100*

FOR FREEDOM'S DEFENCE

Locating and killing the submarine is one of the most important jobs of the Avro Shackleton. It has the most advanced radar and the finest navigational equipment in the world. It has very long range, and, even with full tanks, it carries comprehensive military equipment. Exceptional care has been taken to minimise crew fatigue, and to enable maximum crew efficiency to be maintained during its unusually long missions. While Shackletons are operational with Coastal Command, Avro continue their intensive and expanding jet research programme with the Ashton and the 707 Delta Wing.



AVRO *Shackleton*

A FULL QUIVER FOR FREEDOM'S DEFENCE

AST

AIRCRAFT DIVISION

In jet development Air Service Training Ltd. is playing an important part ; the Aircraft Division is undertaking specialist research and development work, particularly on the installation of gas turbines. Typical installations are the Sapphire Lancastrian, the Derwent Lincoln, the Mamba Lancaster and the Sapphire Meteor here illustrated.

TRAINING DIVISION

The Training Division trains the men who man the machines. Royal Air Force and Royal Naval training units are based at Hamble and Ansty.

HAWKER SIDDELEY GROUP

CIVIL AVIATION . . .

below the international level; (5) The heavy burden of landing fees (had the average Continental landing fees applied in the U.K., costs would have been reduced by 26 per cent). For these reasons, also, the cost of each ton-mile operated on B.E.A.'s Continental services was some 12 per cent less than on the internal ones. Revenue, on the other hand, was 29 per cent higher per c.t.m. With new types of aircraft, the report states, B.E.A. Continental services will certainly become profitable.

Regarding air mail, it is stated that negotiations are under way with the Post Office for an increase in the rates paid for mails carried on the internal services. At present they are substantially less than the rate paid for Continental services. An important development during the year was the introduction, by B.E.A and Aer Lingus, of night mail services from Manchester to Belfast and Dublin respectively.

Although B.E.A. carries all classes of Post Office mail—first and second, parcel and newspaper—by far the largest consists of first-class mail, and the average rates received by B.E.A. were: internal mail, 7s 3½d a ton-mile; British mail, 9s 10½d a ton-mile; foreign mail, 10s 2½d a ton-mile (3 gold francs per ton-kilometre). The last figure represents the internationally accepted rate which, had it been applied to all first-class mail carried by B.E.A., would have represented an increase of £60,000 in mail revenue.

As in previous years the largest item in B.E.A.'s expenditure was the payment of wages, salaries, allowances and pension fund contributions. The total of nearly £4,300,000 under this head represents 43.8 per cent of B.E.A.'s operating expenditure and is a 15.6 per cent increase on the previous year. These payments for each member of B.E.A.'s staff average £609 in 1950-51 compared with an average of £573 in 1949-50.

The second largest single item of expenditure during the year was the cost of fuel and oil, representing 15.2 per cent of the operating expenditure and including £200,600 paid in fuel tax. On the flights on which duty is payable, fuel tax is equivalent to £4 for every hour flown. Tax was increased from 9d a gallon to 1s 6d in April, 1950, and a further increase of 4½d was imposed by the 1951 Budget. Thus, in 1951-52 B.E.A. will pay approximately £250,000 in fuel tax. This is a large factor in rendering B.E.A.'s internal services unprofitable. For comparison, only six states in America impose a non-recoverable fuel tax, the average being 5 cents (4.3d) per gallon. B.E.A. pays 22.5d a gallon.

A great deal of interesting information regarding B.E.A.'s aircraft fleet is contained in the report. Four basic types were in use during the year—the Vickers Viking 1B, the Douglas Dakota 3, the de Havilland D.H.89A, and the Sikorsky S.51 helicopter. On March 31st the total fleet stood at 115 aircraft, with a written-down book value, including spares, of £2,625,328. One Viking and one Dakota were lost. A Bristol Freighter was bought primarily for the purpose of transporting the Bristol Centaurus power plants for the Elizabethan class aircraft to outstations when engine changes are necessary. Between-times, the Freighter is operated on normal Continental freight services.

Vikings again undertook the major portion of the Corporation's work—66.1 per cent—and Dakotas carried 24.8 per cent.

It is B.E.A.'s policy to operate, so far as possible, only with British aircraft and to co-operate fully with the industry in the development of new and advanced aircraft types. At the end of the year 49 aircraft of four types, at a total cost of £9,400,000, including spares, were on order: 20 Elizabethan class (Ambassadors, 47 passengers); 20 Discovery class (Viscounts, 40 passengers); 7 Clansmen class (Marathons, 20 passengers); 2 Dart-freighters.

It is now planned to bring the Elizabethans into service this autumn, the Discoveries late in 1952, and the Clansmen early in 1952.

Looking to the future, the Corporation foresees a development of the Elizabethan, possibly with four Dart engines; an Elizabethan modified as a freighter; and two classes of multi-engined helicopter, to carry up to 20 and up to 40 passengers respectively.

Orders have been placed with Air Trainers, Ltd., for two flight simulators, one for the Elizabethans and one for the Discoveries. They will be delivered in 1952 and installed at London Airport.

Authorized overhaul periods for the aircraft now in service have been extended by the A.R.B., and on March 31st engine overhaul periods were for Vikings, 1,050 hours, Dakotas, 900 hours, and Islanders, 1,000 hours.

During the year there have been developments of outstanding significance for the future in helicopter operations, notably the introduction of the Welsh passenger service. Regularity of 96.6 per cent was achieved during the summer, and 72.1 per cent during the winter, and punctuality was good. The main cause of irregularity was low cloud and low visibility, and only on three occasions was failure to operate caused by mechanical fault.

BRITISH OVERSEAS AIRWAYS CORPORATION

THE efforts of B.O.A.C. have resulted in an even greater measure of recovery than have those of B.E.A. The reduction in the former Corporation's adverse balance was an improvement of 41.4 per cent, while the operating loss was 49.6 per cent less than that of the previous year. For comparison, the improvements achieved by B.E.A. were 28.2 per cent and 34.6 per cent respectively. B.O.A.C.'s gross deficit was reduced by approximately £3½ million, from £7,791,887 to £4,565,428.

Staff strength has been reduced to 1,340 less than the previous year's total, and, with a modern and competitive fleet now in service, B.O.A.C. appears to have got into its stride at last. By the end of the year, the passenger fleet consisted entirely of four-engined, pressurized machines—22 Argonauts, 10 Stratocruisers, 10 Constellations and 16 Hermes IVs. The new fleet, incidentally, made possible an increase in average payload-capacity, from 4.82 to 5.88 tons per aircraft. It also meant that the output per aircraft flying-hour rose from 973 to 1,297 capacity ton-miles.

Other salient points from the statistical results are that operating revenue rose healthily from £19.5 to £22.25 million, attributed generally to increased traffic throughout the world. Even more satisfying from the Corporation's point of view, however, was the fact that, in the face of the rising costs, it was found possible to reduce unit operating cost from 43.5 to 39.5 pence per c.t.m. An important indication of progress, also, is the fact that the break-even load-factor was brought down from 90 per cent in the previous year to 75 per cent. The average load-factor on scheduled services was seen to have risen to 59.7 per cent of payload capacity as compared with 55.5 per cent the year before. In point of fact, the actual load-factors achieved had been falling steadily until last March, but picked up as the result of an intensive sales drive.

From the "balance-sheet" aspect it is interesting to note that the Corporation account actually showed an earned surplus of £1,434,572 against the original Exchequer grant of £6,000,000 for the year. In addition, there were profits from the disposal of aircraft and the redemption of Airways stock amounting to £620,951, which made a total surplus of £2,055,523. Normally this sum would have been available for writing-off the accumulated deficiency brought forward from the previous year, but it was decided that, in view of the rapid development of aircraft and engine design, it might be wiser to make some provision for the contingency of existing types being withdrawn before their normal period of obsolescence. (At the moment the Hermes IV amortization period is given as seven years). Accordingly, a special reserve of £2,000,000 has been set aside.

Although a good one, this year was not without its disappointments. The dislocation caused by the electricians' strike at London Airport in November was estimated to have cost approximately £350,000 in loss of revenue. It was originally hoped, also, that, by introducing Argonauts on trunk routes to South America, traffic would pick up considerably. Although there was an improvement it was not up to expectations, and, in fact, 63 per cent of the Corporation's total operating loss (£3,311,956) was incurred on South American services. In view of this, services on the Western Coast route between Kingston and Santiago were temporarily withdrawn on May 1st. The South American East Coast route is considered to offer good long-term prospects and a drive is being made to achieve higher load-factors in the face of particularly strong competition in that area.

On African routes the outstanding feature was the replacement of Solents and Yorks by Hermes IVs, and on Far-Eastern routes, in spite of an increase in the number of services operated, the average load-factor was maintained at over 75 per cent throughout the year. The popularity of North Atlantic flights also remained at a high level and during the year B.O.A.C. actually carried 36.4 per cent and 32.6 per cent of the total passenger traffic on this route in the west- and east-bound directions respectively. Since the end of the financial year these percentages have risen; in April B.O.A.C. carried more passengers from New York to London, and Montreal to London, than any other Atlantic airline.

So far as the Corporation's future fleet is concerned, plans are focused entirely on British aircraft. Nine Ghost-powered and six Avon-powered Comets are already on order and an option for six more Avon versions may be exercised if required. Six Bristol 175s (with an option on nine more) have already been ordered, and it is believed that, powered by Proteus Mk. III turboprops, this type should be able to match the operating cost of the highly developed Super-Constellation.

Freight traffic rose satisfactorily during the year with an increase of 28.6 per cent, and mail (at 2,272 tons) also showed an increase of over 20 per cent. Like B.E.A., however, B.O.A.C. seems to have just cause for complaint with regard to the mail rates which the G.P.O. are now paying. These are considerably below the six-gold-franc level internationally accepted, and must have a considerable influence upon revenue.

CIVIL AVIATION...

BREVITIES

A CIVIL air agreement was signed in Beirut last week by the British Minister to the Lebanon and the Lebanese Minister of Foreign Affairs on behalf of their respective governments. Each country has granted the other permission to operate scheduled air services to and through its territory. The agreement is on the liberal (or "Bermuda") pattern and it is intended to establish a firm basis for the further development of communications between British territories and the Lebanon.

* * *

B.E.A. was due to make an inaugural Ambassador flight on the London-Paris route last Saturday. It has been announced that the Corporation expects to take delivery of the first five Ambassadors by September 21st. Known as Elizabethans, the type will progressively replace Vikings on several European routes.

* * *

Canadair, Ltd., has received a $3,400,000 order from the Canadian Department of Defence for the repair and reconditioning of DC-3 and Canadair aircraft used by the R.C.A.F. Another large contract recently issued by the same department was awarded to the Bristol Aeroplane Company of Montreal (formerly Canadian Wright, Ltd.) for the repair of Rolls-Royce engines.

* * *

Using a new type of "cattle pen" in a Bristol Freighter, Australian National Airways recently flew several loads of pedigree cattle to the Brisbane Show. One consignment was described by A.N.A. as "an Australian record for livestock load lifted by one aircraft." It comprised nine Shorthorn bulls, each weighing nearly half a ton. Another 7,600-lb consignment of Hereford cattle was also flown to the same destination.

* * *

With six Bristol Freighters in service, Silver City Airways had by mid-August carried more vehicles on their cross-Channel ferry service than in the whole of last season's operations. On July 28th a new record of 42 round trips in one day was established. Services are now being operated on a year-round basis.

* * *

It has been announced by the Argentine Air Ministry that all private aircraft have been banned from flying over greater Buenos Aires or from approaching the nearby coasts unless prior permission has been obtained. They will apparently be shot down if they disobey orders to land from Air Force patrol aircraft. A "restricted zone" has been established over Buenos Aires running parallel to the Uruguayan coast, from the estuary of the Parana River in the north to La Plata in the south. Regular commercial airline flights, however, are not affected, as they already follow established routes in and out of the metropolitan area.

* * *

The inauguration of the Christchurch-Melbourne air service last month elevated Harewood to the position of New Zealand's third international terminal. Harewood is considered the best location in the island close to a centre of population which is suitable for a trans-Tasman terminal.

* * *

Mr. J. Baldwin, chairman of the Canadian Air Transport Board, has appointed the Canadian Commercial Air Attaché in London, Mr. J. H. Tudhope, and a member of the Board's engineering staff, to represent the Board's views on the commercial use of jet aircraft at the Commonwealth Conference, to be held in London from September 25th to October 5th.

* * *

Lord Douglas of Kirtleside, chairman of B.E.A., intimated during a recent visit to the Shetlands that two aircraft might be brought into daily operation between the Shetlands and the Scottish mainland next year. He suggested that one of these might provide a direct service between Aberdeen and Sumburgh without an intermediate call at Kirkwall; 20-seat Marathons would be used.

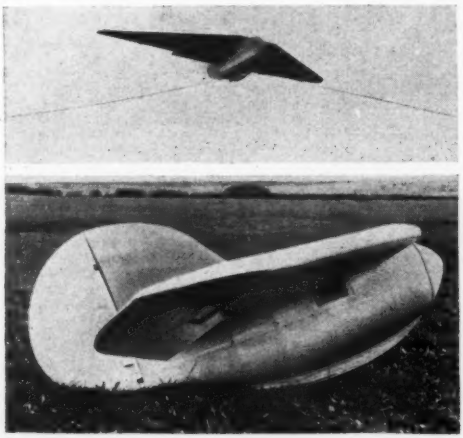
* * *

The first transport aircraft in the world to use mixed power units made its maiden flight on August 23rd. It was the Fouga CM.101 R, a 14-passenger transport which is actually fitted with two Snecma 12SO engines, delivering 1,160 h.p. each, and two Turboméca turbojets, each of 220 kg static thrust. The flight lasted 50 min and the pilot was Léon Bourrieau, who, it will be remembered, was also responsible for the prototype tests of the Fouga series of jet-powered sailplanes.

* * *

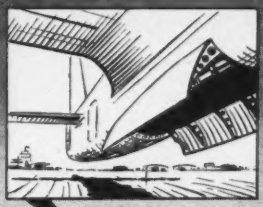
At a meeting held in Dublin recently, the Irish Airline Pilots' Association decided to accept, as a basis for negotiation, an Aer Lingus proposal to reduce flying hours to a maximum of 100 hr during any one month and to 285 hr for any three-month period during the summer schedules. It is understood that this proposal was agreed to because the company has undertaken to start negotiations immediately on grievances concerned with flying times, salaries and general working conditions. The Association had previously decided to call upon pilots to cease flying.

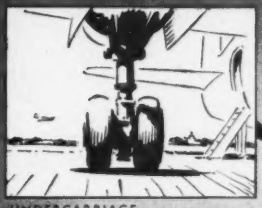
GLIDING REVIVAL IN GERMANY



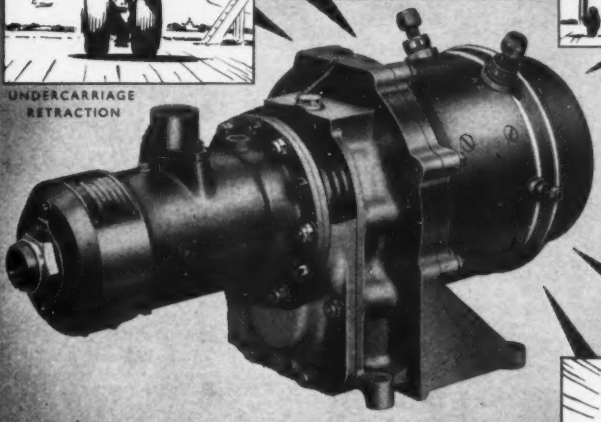
The recent lifting of the ban on gliding in Germany was the signal for a show of activity which suggests that, even if actual construction and gliding were banned, designers at least must have been hard at work behind locked doors and shuttered windows. In a miraculously short space of time some extremely interesting craft have appeared. It is claimed that the tailless prototype shown in the left-hand photograph was built for as little as £35. On the right, a German-built Grunau Baby is seen under starter's orders during the first gliding contest to be held in Germany since the war. It was held at the Wasserkuppe—now feared to be too near the Soviet zone to continue safely in use.

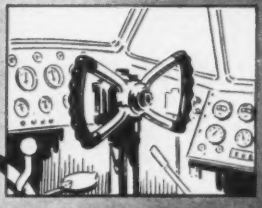
MESSIER

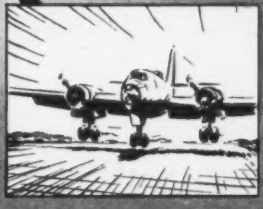

BOMB DOOR OPERATION


UNDERCARRIAGE RETRACTION

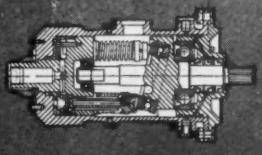
FLAP OPERATION




POWER FLYING CONTROL


BRAKES

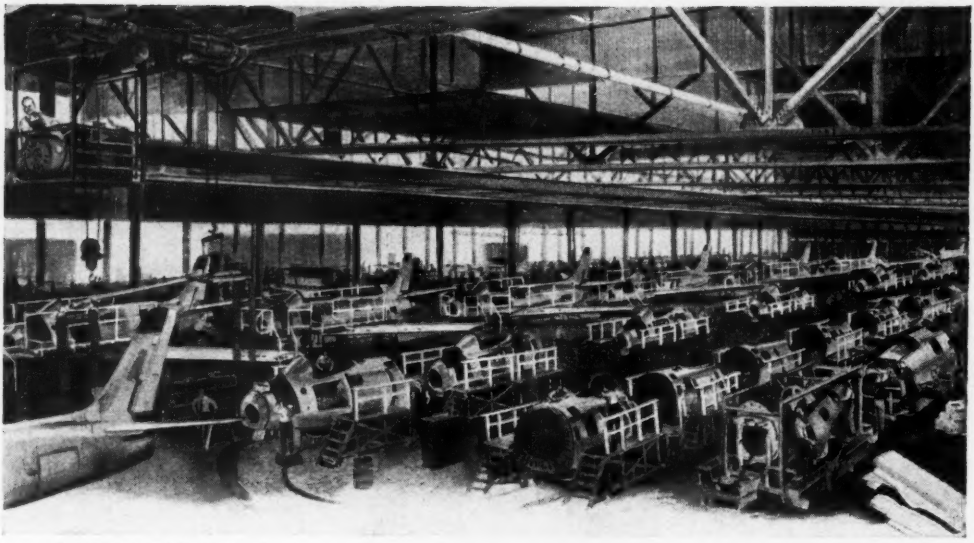
4000 lb. per sq. in. System



The heart of the Messier 4000 lb/sq. inch hydraulic system is a seven piston swash plate pump, engine driven or directly coupled to a high speed electric motor.

Electric drive offers many advantages in installation and functioning which offset the weight of the motor itself . . . .

BRITISH MESSIER LTD. GLOUCESTER



A portion of the F-86 assembly area, Plant 2, Canadair Limited, Montreal, Canada.

CAPACITY TO BUILD - *Thousands of planes!*

Moving steadily through thousands of separate manufacturing steps in 40 acres of modern factory space . . . passing along more than two and a half miles of assembly flow lines . . . through the hands of thousands of skilled Canadian workers . . . F 86 Sabre* jets are rolling out for delivery at Canadair.

From preliminary design to final assembly, Canadair is equipped to produce every type of military and civil aircraft. The plants at Canadair, with their adjacent runways, stand high among the most modern aircraft manufacturing facilities in the entire world. We welcome enquiries regarding the design and manufacture of any type of aircraft.

For further information:
European Representative, J. H. Davis.
Princes House, 190 Piccadilly, London, W1, England.

Vignettes of
CANADA—AIR LAND

Aircraft manufacturing history in Canada goes back a long way to a day in September 1907, at Baddeck, Nova Scotia . . . when the Aerial Experiment Association was formed by Dr. Alexander Graham Bell, J. A. D. McCurdy (presently the Lieutenant Governor of the Province of Nova Scotia), F. W. Baldwin and others. In the "Silver Dart" — built by the Association — McCurdy made the first successful flight within the British Empire and Baldwin, in the "Redwing", was the seventh man in the world to fly an aircraft.

Since those early adventurous days, Canadian aircraft production has increased beyond the wildest dreams of the pioneering airmen of Baddeck. Today, Canadian aircraft manufacturing companies are designing and quantity-producing some of the world's finest aircraft . . . built by skilled Canadian labour.

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HERE AND THERE

Thunderjets for Denmark

FOUR F-84 Thunderjets made available to Denmark under the military-aid programme were handed-over recently in Copenhagen by General Eisenhower.

Helicopter Expansion

KAMAN AIRCRAFT CORPORATION is to build a two-million-dollar plant at Bloomfield, Conn., for the construction of naval helicopters. Present activities are at Bradley Field, Windsor Locks, Conn., where test-flying has to be done within the airport traffic-pattern

Bulldozer Call-up

THE surplus earth-moving equipment of the Overseas Food Corporation in Tanganyika has attracted the interest of the R.A.F., who believe that many British and Middle East requirements could be met from these stores. Two squadron leaders are now touring the Corporation's areas with the director of the East Africa Stores Disposal Board, which is handling both the O.F.S. and Service disposals.

Wilbur Wright Lecture Venue

ORIGINALLY to have been held at the Institute of Civil Engineers, the Royal Aeronautical Society's 39th Wilbur Wright Memorial Lecture is now to take place at the Royal Institution, 21, Albemarle Street, London, W.1. The date is Monday, September 10th, the time 6 p.m., and the title of the lecture *The Well-Tempered Aircraft*. It will be read by Mr. A. E. Raymond of the Douglas Aircraft Corporation.

Putting up a Black

ACCORDING to a Cape Town report, a 17-year-old schoolboy who had never received flying instruction borrowed an Auster from Young's Field Airport and made a two-hour solo flight, beating-up his school in the process. He then discovered that he had no idea how to land. Resourcefully, he dropped a note on the airfield, and another pilot took off in a Piper Cub, flying alongside the Auster and displaying landing-instructions on a blackboard. Taking it all in, the boy made an almost perfect landing. The fact that he thereafter collapsed from strain does little to detract from the value of the incident as a tribute to the Auster's ease of handling.

SYCAMORE PLANTATION : Bristol 171 helicopters (Alvis Leonides) are now, as seen in the picture above, in steady series production. "Sycamore" is the designation of the Service version.

"FELLOWSHIP OF THE AIR"

THE Jubilee book of the Royal Aero Club is published today under the above title. This unique, intimate official history of the people and events which in fifty years have built-up the traditions of British aviation has been written by B. J. Hurren and is published for the R.Ae.C. by Iliffe and Sons, Ltd. A review appears on page 279.

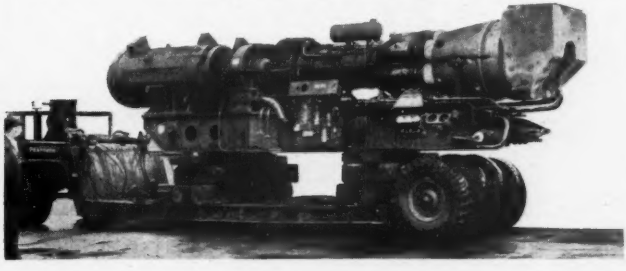
All this and Autos Too

BY the late autumn some 6,000 workers are likely to be employed on aircraft production at the vast Willow Run works of the Kaiser-Frazer Corporation, which is tooling-up for the production of Fairchild Packets. At the same time Mr. Edgar Kaiser actually aims to increase car production at the factory in an effort to meet the ever-growing demand.

Air League A.G.M.

THE Annual General Meeting of the Air League of the British Empire is to be held at Londonderry House at 2.30 p.m. on Tuesday, September 18th. The annual report, to be presented at the meeting, reviews 1950-51 activities, most prominent among which were the League's efforts to draw public attention to the nation's air defences. Satisfaction is expressed at the progress of the A.T.C. Flying Scholarship Scheme, which was originated by the Air League. Although preoccupied with defence matters, the League has also been able to take a lead in organizing protests against the increases in tax on aviation spirit and in the campaign to restore the Airmet broadcasts. Reference is made, too, to the "inadequate" payments made by the Postmaster-General to B.E.A. and B.O.A.C. for the carriage of mail.

NEW-ERA TRACTION : The gas-turbine generator set for the Metrovick locomotive for British Railways (Western Region) on its way to the makers' main factory. Two axial-flow turbines operate on independent shafts, the first driving a compressor and auxiliaries and the second the main generator which supplies power to the traction motors. Metrovick, it will be remembered, played an important part in aircraft gas-turbine development, their designs—including the Beryl and F.9—being put at the disposal of other makers.



IN BRIEF

ENTITLED *Fifty Years of British Standards*, a specially written history of the British Standards movement has been published, at 10s. 6d., by the B.S.I., at 24, Victoria Street, London S.W.1.

* * *

The first modern-type catalytic cracking unit to be constructed in Europe has been completed at Shell's Pernis refinery near Rotterdam. It is expected to have a capacity of about 1¼ million tons per annum when it comes into full operation.

* * *

Mr. B. H. Hornung, chairman and managing director of Suflex, Ltd., is making a world air tour for the purpose of visiting the company's customers and representatives. Suflex, Ltd., are manufacturers of insulating sleeving, braiding, parachute nylon cord and other materials.

* * *

Among winners of the 1950-51 awards of the Institute of Transport are Mr. D. O. Bustard of B.O.A.C. (student-award for his paper, *Passengers by Air*); Mr. O. C. Cochrane, also of B.O.A.C. (first place in associate-membership examination); and Mr. R. W. Spurgeon, of the M.C.A. (second place in graduateship examination).

* * *

An annual "classic" among catalogues s the Dunlop Aviation Year Book, the 1951 edition of which, recently published, depicts a wide range of the company's products. These include manufacture and installation of aircraft tyres, brakes and braking systems, actuators, windscreen wipers, armament de-icing systems and very many items of associated equipment.

* * *

The City and Guilds of London Institute for the Advancement of Technical Education announces the appointment of Mr. J. W. Voelcker, A.C.G.I., B.Sc., A.M.I.E.E., as secretary, in succession to Mr. G. S. Stephenson, A.C.A., who has retired, but who will continue to help in an advisory capacity. Mr. Voelcker was formerly with the English Electric Co.

I.A.T.A.—PARLIAMENT of the WORLD'S AIRLINES

The Background of the Association that Meets in London Next Week

The late Sir W. Sefton Brancker who, in 1919, was responsible for forming the original I.A.T.A. organization.

ON Monday next, September 10th, the eyes of the air transport world will be metaphorically focused on London, where the Seventh Annual General Meeting of the International Air Transport Association is due to open. The uninspiring label of "annual general meeting" perhaps belies the true nature of the event; it is rather a council of war at which commercial-battle resources are reviewed, operational tactics overhauled and agreement reached upon future campaigns.

The meeting will convene in the Great Hall of Westminster School, Little Dean's Yard, and will last from September 10th to 14th inclusive, though on September 12th there will be a recess to allow delegates to visit the S.B.A.C. Display and Exhibition.

On the opening day a spokesman for His Majesty's Government will welcome the delegates; Sir Miles Thomas, D.F.C., M.I.Mech.E., M.S.A.E., will take office as president; and the Director-General, Sir William Hildred, C.B., O.B.E., M.A., will give his preliminary address.

Although most of our readers will be conversant with the *raison d'être* of I.A.T.A. there are several aspects of the Association's history and scope which are probably less widely appreciated. We therefore publish here a brief account of some of the highlights of its growth and activities.

IT has been said that the aeroplane is an architect of an ever-changing world—a craftsman whose work encompasses the constant redressing of frontiers and the shrinking of continents to neighbourhoods. It follows, therefore, that international air transport never has been, and is never likely to be, a purely commercial affair. Its development to date, although meteoric, has inevitably been hampered by the early established principle that nations retain exclusive sovereignty of the air over their territories, and with it the right to exclude foreign commercial operations. It was long ago appreciated, however, that development would continue even under these conditions. It became obvious to most nations that the greatest benefits were to be derived from the fullest reciprocity and the elimination of cut-throat competition and uneconomic services.

International co-operation in air transport matters thus became the concern of governments even more than of the commercial interests to which the airlines owed their inception. Not only for reasons of economy, however, was it found necessary to establish multi-lateral collaboration, for it was quickly appreciated that air transport is also an instrument of national policy, having a close alliance with military strength and, consequently, an essential bearing on the problems of world order.

The first attempt at placing the future international air transport under some form of unified control took place as long ago as 1910, but little progress was, in fact, made until the end of the First World War. Under the technical stimulus provided by the struggle, flying-machines had quickly become instruments of great commercial potentiality, and in most countries services sprang up almost instantaneously. A number of organizations came into being to represent the interests of air transport at government level, but thus far independent operators had no recognized method of co-operating among themselves.

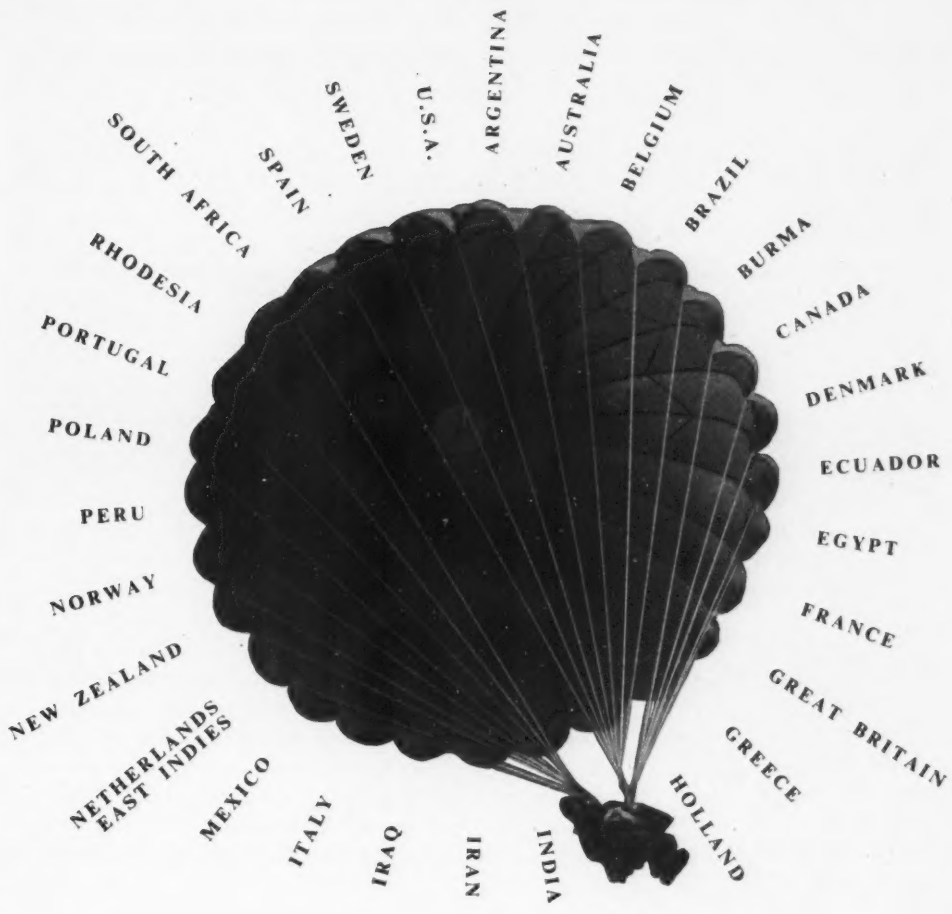
It was in 1919 that Mr. George Holt Thomas, then head of a British company, Aircraft Transport and Travel, Ltd., conceived the idea of forming an airline association. The plan was immediately put into action by Maj.-Gen. (later Air Vice-Marshal) Sir W. Sefton Brancker, who was then associated with A.T. and T. He it was who issued invitations to the six member airlines to attend the first meeting of the International Air Traffic Association (as it was then known), which took place in The Hague in 1919. He presided personally over the session, in which Swedish, Norwegian, Danish, Dutch and German operators joined. At that time the total volume of the entire industry's traffic for the year amounted to about 1,000,000 aircraft-kilometres, or approximately one-third of that which the Association's members now achieve in a single day. With such limited experience it was, therefore, difficult for the founders of the organization to plan for the future. Even so, they knew that the possibility of a colossal network of air routes spreading over nearly the whole of the earth's surface was no longer a mere vision. It was also clear to them (as reported later by Jonkheer van den Berch van Heemstede, then general manager of I.A.T.A.) that "purely national or domestic operations would not be of sufficient interest to make air traffic a commercial proposition"; they accordingly shared Mr. Thomas' feeling that air traffic was an international question.

The original I.A.T.A. compact was nothing more than a brief agreement drawn up in General Brancker's own handwriting on one-and-a-half sheets of paper; it outlined a few simple rules and explained that the Association had been formed "to co-operate to mutual advantage in preparing and organizing international air transport." The companies concerned were Nederlandsche en Koloniale Luchtverkeer Maatschappij (later to become K.L.M.); Aircraft Transport and Travel, Ltd. (U.K.); Det Danske Luftfartselskab A.S. (Denmark); Deutsche Luft Reederei (Germany); Det Norske Luftfartrederi (Norway); and Svenska Lufttrafik A.B. (Sweden). Signed on August 28th, 1919, the agreement merely gave its six members a method of comparing notes, adjusting relationships and, perhaps, of providing mutual moral support in the face of difficulties which, though expected, remained conjectural.

The early operations of I.A.T.A., like those of the industry which it serves, were small and tentative. Although the six founder-members were joined in the first two years by other British, French and Belgian operators, it was not certain until 1925 that I.A.T.A., or the principles of free association which it represented, would survive. In the fever of airline activity which characterized those early years, several similar airline associations were organized, but were soon dissolved for one reason or another. The main challenge, however, came from a group of central European companies organized under German control as a cartel. Mainly in the hands of the monolithic Junkers concern, it was known as the Trans-Europa Union. The airlines involved in it were supplied with what, at that time, were highly competitive aircraft, and it was backed by a government which did not then have to support a military budget. For these reasons it was a formidable opponent and, had the time been favourable, might have forced its way into participation with its competitors, or even, eventually, taken them over altogether. Air routes might then have been allotted with the calculated meticulousness typical of the Teutonic mind, and the idea of free association between the airlines of Europe would quickly have become an obscure chapter in the history of commercial aviation. Fortunately, the time was not ripe. Air transport had not the facilities to pay its own way, operators had to be subsidized, the financial strain on the Junkers concern became too great, and the threat melted away. Some of the Junkers companies vanished altogether and others slowly joined I.A.T.A.

By 1929, the Association had 23 members, which was, in fact, almost the sum total of the companies operating in Europe. Membership was gradually extended to include the airlines of other continents and, by 1939, Africa, Asia and North and South America were also represented.

The early history of the Association is expressed entirely in terms of its twice-yearly meetings, which moved from one European city to another among the headquarters of I.A.T.A. members. Apart from the secretary-general, whose title was later changed to that of director-general, the only officers of I.A.T.A. were the chairmen of the meetings. With the exception of Sir Sefton Brancker, who presided over the first meeting at The Hague, these chairmen were invariably the heads of member-companies in the countries in which the meeting was taking place—a tradition which has persisted to this day. Incidentally, the Association has already met four times in London—in 1923, 1925, 1928 and 1933; at all four meetings the chairman was Mr. G. E. Woods Hum-



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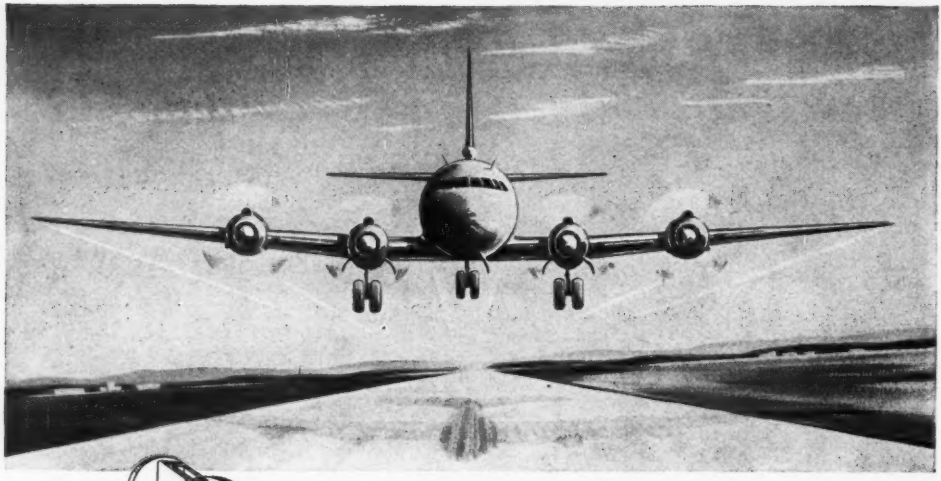

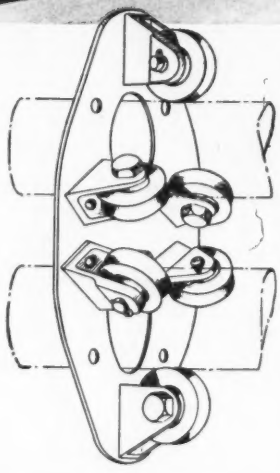

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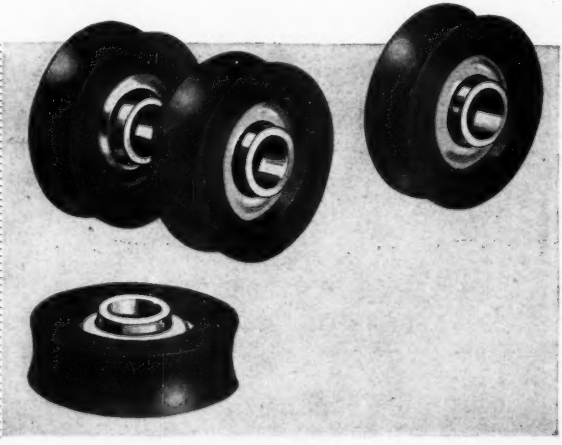
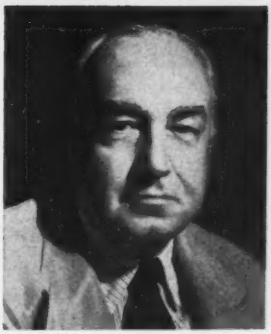


PARLIAMENT of the WORLD'S AIRLINES



President for the coming year is Sir Miles Thomas (left), chairman of B.O.A.C., who will take office at the Plenary Session on September 10th. I.A.T.A.'s Director-General since 1946 has been Sir William P. Hildred (right), previously U.K. Director-General of Civil Aviation.

phery, on the first two occasions as head of Daimler Airways and on the other two as chief of Imperial Airways.

The principal function of each meeting was to hear reports by member airlines on what had been achieved and to discuss their plans for the future. From this there was evolved a general exchange of technical and commercial information, which, in turn, led to the compilation of statistics as a basis for co-ordinating schedules and timetables. As the Association grew this process became better organized, until, in 1937, the general meeting was made an annual affair; the principle of direct discussion between the heads of companies and the concentration of authority in the meeting itself remained.

When a central office was established in 1920 at The Hague, Jonkheer van den Berch van Heemstede was appointed Secretary-General, a post which he continued to hold until 1939. By the end of its first ten years, I.A.T.A. had formed five separate working committees, dealing respectively with legal, postal, radio-telegraph and cash examination problems. Several more working groups were added later. By 1934 the Association had acquired an emblem and a flag which it authorized to be flown by all member airlines.

The advent of the Second World War ended the existence of the Association in its original form. During the war, when Britain offered refuge to the airline managements of a number of the occupied countries, the first efforts towards post-war re-organization were carried out in London by two parallel groups, one a I.A.T.A. committee headed by Major J. McCrindle (now Advisor on International Affairs to B.O.A.C.) and the other a group known as the Conference of International Air Transport Operators (C.I.A.T.O.). As a result of their combined efforts, the new I.A.T.A. was founded at a meeting in Havana in April, 1945. Shortly afterwards, Sir William P. Hildred (who is still in office), was selected as the first Director-General, and the first annual general meeting was held in Montreal in October, 1945.

In addition to taking an active part in the founding of the pre-war and post-war associations, the British airlines have, over the years, contributed the services of scores of their ablest personnel to the various standing committees, conferences, and working groups which carry out I.A.T.A.'s work.

While the new association had no legal connection with the old it nevertheless inherited directly the principles and problems of its predecessor. A number of prominent pioneers also gave it the benefit of their long experience; they included men such as Dr. Albert Plesman, Réné Briend, Major McCrindle, Per A. Norlin and Drs. Gorecki and Tombs. I.A.T.A.'s aims, also, were now defined more precisely than were those of the former organization. They were "to promote safe, regular and economical air transport; to foster air commerce and to study its problems; to provide a means for collaboration among operators; and to co-operate with I.C.A.O. and other international organizations." While the annual general meeting was to retain all its authority, an executive committee was appointed to administrate on day-to-day affairs.

Although plans had been made to place the question of tariffs and conditions of carriage in the hands of regular regional conferences, political developments brought this aspect of I.A.T.A.'s work into the limelight sooner than was expected. The Chicago Conference of 1944 had failed to propound any working rule for the regulation of world airline economy, mainly because of the grave conflict between the American advocates of free competition and the British, who thought that some degree of international control should protect the interests of countries providing air transport. A fresh attempt was made at Bermuda in 1946 and, under the compromise reached there, the determination of acceptable rates was delegated to the I.A.T.A. Traffic Conferences, with the stipulation that the rates could not become effective until both governments concerned had approved them. By this means adequate control was ensured over cut-throat competition and rates could be kept as low as possible in the interest of the travelling public. This agreement actually paved the way for more than 60 others, which followed in quick succession.

The scope of I.A.T.A.'s work never ceased to expand and the Traffic Conferences have since been responsible for bringing into existence standard forms of tickets, baggage checks, waybills and

(*Concluded at foot of page* 282)

NOW IT HAS BEEN TOLD . . .

MORE than once we have heard historians, saddled with the task of recording the early origins of this or that sport or science, bewail the fact that the records they must consult are spread piecemeal among scores of different publications, or, worse still, defy location anywhere.

The aeronautical historians of the future will at least be spared such travail when they come to seek the story of British aviation of the earliest days, and of sporting-flying activities of later years. For the first time, the full record has been set down in narrative form, for the story of the Royal Aero Club,* now published in connection with its golden jubilee celebrations, is in fact the story of the British private flying movement from 1901 onwards.

That the author, B. J. Hurren—in his spare time from his work with one of our leading aircraft constructors, an official of the Club and an occasional contributor to *Flight*—has spared himself no pains in his researches would be obvious from a study of the book, even to the reader who did not know that the 230-odd large pages are the result of many months of patient delving into R.Ae.C. records—with the willing co-operation of Col. R. L. Preston and other Club officials—of interviews with pioneers, and of investigations in all sorts of unlikely places.

At one and the same time the story is absorbing, inspiring, entertaining and technically instructive. It begins when the idea of forming an Aero Club was first mooted—by a young woman passenger in a balloon floating 4,000 feet above South-East London. Thereafter the reader is introduced to that fascinating, unbelievable era when the ballooning was one of the fashionable pastimes of the Edwardian *haut monde*, and to those whom they regarded as rather unbalanced and slightly raffish—the inventors who, in decrepit shacks on dreary marshes, were toying with weird contraptions of wood and canvas on which they hoped to be borne into the air on the power—such as it was—of early motor cycle and car engines.

Next, new details are revealed of those pioneer aeroplane flights that are recorded as milestones in the history of aviation; new light is thrown on the remarkable characters of the men who made them—and one of the men, incidentally, Lt-Col. Moore-Brabazon (now Lord Brabazon of Tara) contributes a foreword to the book.

Then we learn how the Club co-ordinated the activites of the early pilots, formulating rules for their competitions and records, issuing licences and certificates, and generally laying the firm foundations on which the movement has been built.

Though what, for want of a better term, we know as "private flying" is the main theme of the book, it is inevitable that military aviation should receive considerable attention, for when the Kaiser's war darkened the European horizon it was the sporting pilots, and the builders of their aircraft, who placed their courage and skill at the disposal of the country for the founding of a new fighting power.

After that war came what has been called the Golden Age of sporting flying—of never-to-be-forgotten flights, often made solo in light aircraft, to the farthest corners of the earth: valiant journeys that blazed a trail which the world's airlines were to follow. The men and women who made them are the subject of many of Mr. Hurren's anecdotes.

And so, with recollections of pre-1939 events, he passes on to Hitler's war, and to the vital part that R.Ae.C. members once again played as designers, constructors, and pilots. The final chapters of the book are concerned with the immense progress that British sporting aviation has made since, often in the face of infuriating obstacles but helped and encouraged always by those who give their services as officials of the Royal Aero Club.

Finely bound, printed in large, clear type, and illustrated with over 80 memorable photographs, *Fellowship of the Air* indeed forms a worthy tribute to the achievements of "the first fifty years."

* "*Fellowship of the Air*"—*Jubilee Book of the Royal Aero Club, by B. J. Hurren. Published on behalf of the R.Ae.C. by Iliffe and Sons, Ltd. (publishers of "Flight"). Price* 30*s.*

THE ANGLO-AMERICAN CONFERENCE

This Week's Important Scientific Occasion : Summaries of the Twenty Papers

Major Frank B. Halford, president of the R.Ae.S., who, with Admiral Richardson, his American "opposite number," is presiding over the Conference.

SOME 500 delegates, British and American, are now at Brighton for the Third Anglo-American Aeronautical Conference, which began last Monday with a reception at the Grand Hotel and which concludes with a dinner this evening, Friday, September 7th. Many of them are accompanied by their wives, and an appropriate social programme—with emphasis on tours to places of interest which will appeal to the American guests—has been organized. Most of the visitors, of course, will be staying on for a view of the Farnborough Show next week.

Presiding at the conference are Major F. B. Halford, C.B.E., F.R.Ae.S., president of the Royal Aeronautical Society, and Rear-Admiral L. B. Richardson, F.I.Ae.S., U.S. Navy, Ret., who holds corresponding office in the Institute of the Aeronautical Sciences.

The list of delegates would, indeed, form a useful "Who's Who" of aviation in the two countries, for it would be no exaggeration to say that every aeronautical interest, particularly on the technical and research sides, is represented by famous names.

The main business of the conference, of course, is the delivery of 20 papers (which are being read, under various chairmen, at Brighton's Corn Exchange), equally divided between the two countries, with Canadian and Australian contributions included.

In previous issues of *Flight* brief reference has been made to the subjects of the papers, but on this and the following pages we are able to give summaries of the principal points of each. These notes are slightly condensed versions of some admirable official summaries, the preparation of which must have been a formidable task for the R.Ae.S. officers concerned. In future issues of *Flight* we hope to reproduce at greater length some of those papers which are of more general interest.

Advances in Aircraft Structural Design.

By G. T. R. HILL, *Consulting Engineer to Short Brothers and Harland, Ltd.*

The influence of the pioneers in Great Britain a hundred years ago, Henson and Stringfellow, is traced through the early experiments with gliders to the Wright brothers and their first successful flights. An explanation is put forward of the many fatal cases of structural collapse which befell monoplanes just before the First World War, and it pointed out that knowledge obtained in recent years indicates that these failures were probably due to aeroelastic effects.

The development of metal skin as a practical possibility is traced and the various methods of stabilizing the skin so as to form an effective structure, as well as a satisfactory aerodynamic shape, are touched upon.

The usefulness of the figure of structure-weight percentage is discussed, and the broad conclusions are reached that structural engineers are now more successful in producing structures of low weight, and that large size is not, as was commonly thought in the early days, defeated by the square-cube law. The effect of gusts on structure weight is mentioned, and the possibilities of gust-alleviating devices are set out.

Aeroelastic difficulties are intensified by the introduction of swept wings and tailplanes. Various manifestations of aeroelasticity—loss of control at high speed, divergence, and flutter—are described, together with the methods at present used to keep structural distortions within manageable limits.

Following this survey of structural problems old and new, suggestions are made as to how it may be possible to avoid some of the weight penalties which appear likely to afflict high-speed designs of the immediate future. A so-called "aero-isoclinic" wing is described, having the property of maintaining its tip incidence when loaded, although swept back to any degree required; and for very heavily swept designs the possibilities of sweepback variable in flight are set out.

Infusion of Safety into Aeronautical Engineering Curricula

By JEROME LEDERER, *Director, Daniel and Florence Guggenheim Aviation Safety Centre, Cornell University.*

The gap between theory and practice in aviation engineering has resulted in design errors that have cost thousands of lives and untold millions of dollars. The paper recommends ways to bridge this gap. In addition, it discusses the background of design errors and problems of stimulating interest in safety, and advocates the introduction, as a special course, of the "new science of human engineering." "Background of design errors" is summed-up as consisting of engineers' ignorance, attitude and subjection to economic pressure. To overcome ignorance five principles of safety are suggested for integration into engineering training; they should be supported by specific data at the discretion of the instructor. The five principles are:—

(1) Parts or components of the aircraft other than basic structure should be designed to "fail safe."

(2) The structure and its components should be designed to encounter with safety the impact of objects, rough handling by men and the effects of natural phenomena which are likely to be met in service.

(3) Procedures for adequate maintenance and operating practices established by the designer should be consistent with average human effort, ability and attitude.

(4) The aircraft and its components must be protected against the effects of normally inadvertent or uncontrollable human errors or carelessness.

(5) The aircraft should give its occupants reasonable assurance of protection in accidents which are considered to be survivable.

Development in Australia of a Thick Suction Wing.

By T. S. KEEBLE, *Aeronautical Research Laboratories, Commonwealth of Australia.*

An account is given of the development for flight of a 31.5 per cent thick GLAS II suction aerofoil. The adaptation of a military glider to accommodate the modified wing is described briefly and the more important results of flight tests of the glider are given. The related boundary-layer studies made in the wind tunnel and theoretically are outlined.

An application of the aerofoil to a moderately sized all-wing aircraft is examined briefly; the advantages of this aircraft over its conventional counterpart are claimed to be obvious, and the possibility of building a half-scale model of the aircraft in glider form is discussed.

Structural Problems of Future Aircraft.

By N. J. HOFF, *Head of Department of Aeronautical Engineering and Applied Mechanics, Polytechnic Institute of Brooklyn.*

The attainment of supersonic speeds has given rise to new problems in aircraft structural design and analysis; structural arrangements of present types, developed for high efficiency at subsonic speeds, have to be altered to make them suitable for good performance in supersonic flight. Problems of a new kind are caused by aerodynamic heating, and in the transient state of temperature-distribution thermal stresses arise which can exceed the yield stress of the material. Under steady-state conditions creep phenomena attain importance and may necessitate a revision of current concepts of structural safety.

The problems are defined, and suggestions made towards their solution include discussion of the possibilities of improving the materials of construction. It is concluded that a rapid development is necessary in aircraft structures in order to take full advantage of recent advances in supersonic aerodynamics and the theory and practice of jet propulsion.

Some Problems of Turbine Transport Operation in Europe

By K. G. WILKINSON, *Project and Development Branch, British European Airways.*

British European Airways' early experience with the Viscount prototype on scheduled services is described, and conclusions on traffic control and aircraft handling are drawn. Prospects for the development of efficient operations with turbojet and turboprop aircraft under present traffic-control systems are discussed.

It is suggested that developments in the near future will occur mainly in matters relating to flight planning and fuel-consumption control. This argument is developed in detail and a method is described whereby more exact calculation of fuel requirements for a route can be made. The corresponding problem of offering payload for sale is examined and a complementary method developed; operational use of the "variable booking payload" method is described and discussed.

The operational performance of existing commercial aircraft on selected routes is analysed and compared with the predictions of the proposed method, and the economic consequences for future operations with piston, turboprop and turbojet aircraft are discussed.

It is concluded that optimum operation in present circumstances enables competitive economic results to be achieved with the three types: departure from the optimum, however, can have disastrous consequences with a jet aircraft, as can an increase in fuel costs.

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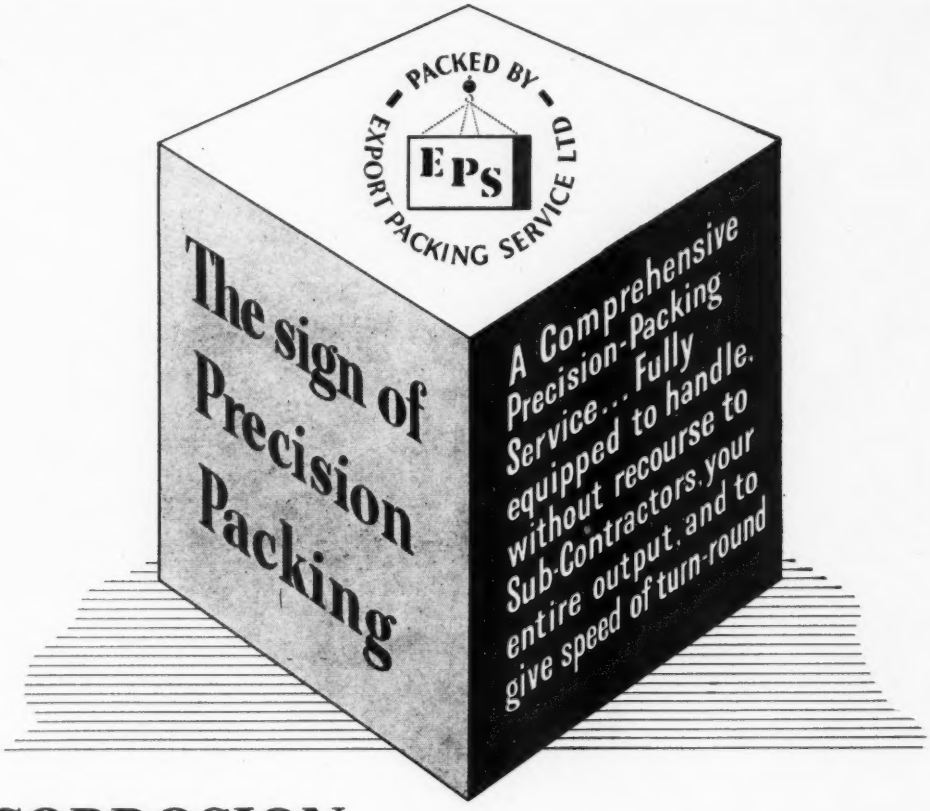
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Performance Characteristics of Jet Nozzles.

By GEORGE S. SCHAIRER, *formerly Staff Engineer, Aerodynamics and Power Plant, now Chief of the Technical Staff, Boeing Airplane Co.*

A survey is made of the performance characteristics which determine the usefulness of a propulsive jet nozzle. Experimental performance of a number of nozzles is presented, based upon dimensional parameters found in one-dimensional nozzle theory. Most contracting nozzles are found to have a very high efficiency, and several forms of variable nozzles are reviewed. A flow from a nozzle must mix with the external flow and inter-actions between internal and external flow are possible; two experiments with fixed flow are examined to show the nature of inter-actions possible. A serious conflict between desirable external shapes and variable-area nozzle requirements is encountered.

It is concluded that most convergent nozzles adhere closely to one-dimensional theory. No suitable theory is available for over-expanded divergent nozzles but experiment confirms the desirable characteristics expected from expanding nozzles. A marked change in external flow is encountered at low internal velocities for the mixed-flow case, while extreme external shapes give poor external-flow characteristics at high Mach numbers. Simple tabs can be very efficient or somewhat poor as a means of changing nozzle area, depending upon detailed arrangement; similarly, plug nozzles can also be very good or quite poor, depending upon small details.

Propellers for High Powers and Transonic Speeds.

By GEORGE W. BRADY, *Director of Engineering, Curtiss-Wright Corporation, Propeller Division.*

Development to increase the forward speed at which airscrews may be used efficiently has been continuous since the Second World War. Results of tests of a number of different configurations, including sweep-back, low aspect-ratio and low thickness-ratio are described, from which it is concluded that low thickness-ratio is the most important factor.

The effect of applying low thickness-ratio to transonic and supersonic airscrews is shown to result in good efficiencies for the transonic type up to Mach numbers of 0.8 to 0.85, and for the supersonic type through the transonic region and well into the supersonic range. Structural and allied problems are reviewed and it is indicated that with high-solidity blades made of a high-modulus material, such as steel, the desired aerodynamic characteristics can be obtained with a structurally satisfactory design.

Overall performance of a high-output turboprop power unit with both transonic and supersonic airscrews is examined, and other important performance advantages of airscrew propulsion, such as high take-off thrust and reverse thrust for aerodynamic braking, are outlined.

Plastics and Plastic Structures.

By J. E. GORDON, *Head of Plastic Structures Section, Chemistry Department, Royal Aircraft Establishment.*

The author of this paper states that plastics are unsuited to fabricated structures, but offer the possibility of making large components of a highly integrated nature. If this is to be done, he points out, the necessary changes must extend beyond a mere substitution of materials and must imply some radical changes in engineering practice. Plastic structures research at the Royal Aircraft Establishment, some aspects of which are examined, represents an attempt to develop a new kind of engineering on these lines and is in many respects parallel to similar American work, although differing in materials and moulding methods.

Materials and methods have been developed whereby complex mouldings of large size can be quickly and easily made with comparatively cheap equipment. A series of parallel-section wings have been moulded which are somewhat more efficient than their metal counterpart, and the manufacture of delta wings for flight trials is now well advanced.

Although, weight for weight, the mechanical properties of plastics are somewhat inferior to those of the better light alloys, it is suggested that, where the torsional stiffness requirement is not too severe, structures as light as, or lighter than, metal ones can be made by designing with the particular advantages of plastics in mind.

Plastics offer considerable production and development advantages, and also solve certain problems connected with the provision of suppressed aerials and of heat- and sound-insulation. Besides this, smooth surfaces are comparatively cheaply and easily attainable.

The Reduction of Drag by Distributed Suction.

By SIR MELVILL JONES, *Francis Mond Professor of Aeronautical Engineering, University of Cambridge, and* S/L. M. R. HEAD, R.N.Z.A.F., *Engineering Dept., University of Cambridge.*

Recent experiments have demonstrated the effectiveness and limitations of distributed suction as a means of achieving extensive laminar flow. Both in the absence of a pressure gradient and in adverse gradients similar to those obtaining over normal aerofoils it has been found possible to suppress normally occurring transition by the use of suction quantities which are sufficiently small to make possible very considerable reductions in overall drag. Extensive laminar flow can be achieved in this way, however, only if regions near the front of the surface are free from such roughness as may be expected to cause transition in the absence of suction. If the considerable difficulties of constructing and maintaining a sufficiently smooth and uninterrupted porous surface can be overcome, then it may be found possible to achieve laminar flow over virtually the entire surface of an aircraft, with far-reaching consequences to the economics of air transport.

A Review of High-speed Hydrodynamic Development.

By ERNEST G. STOUT, *Assistant to the Chief Engineer, Consolidated Vultee Aircraft Corporation.*

With the introduction of free-flight-model research, a new applied science of marine-aircraft hydrodynamics has been established, based primarily upon the concepts of the aeronautical sciences, as opposed to the tenets and philosophy of naval architecture.

This paper reviews the principal design criteria that have evolved during the course of this study and applies these findings to the development of practical water-based aircraft that demand little, if any, compromise with contemporary aerodynamic design. For convenience, the discussion is divided into the particular requirements for subsonic, transonic and supersonic flight régimes.

It is concluded that a "blended hull" (or other suitable aerodynamic forms of high critical Mach number) can be developed that will exhibit hydrodynamic performance characteristics equal to, or in many cases exceeding, the highest standards of current marine-aircraft design. Such a development, maintains the author, should go far towards substituting scientific strategic planning for the defeatist attitude represented by "the outmoded classical argument of 'seaplane versus landplane.'"

Heat Transfer Studies Relating to Rocket Power-Plant Development.

By LOUIS G. DUNN (*Director*), WALTER B. POWELL (*Senior Research Engineer,*) *and* HOWARD S. SEIFERT (*Staff Engineer*), *Jet Propulsion Laboratory, California Institute of Technology.*

This paper discusses work relating to the transfer of heat in rocket motors. Part I contains a general description of convective and radiative heat-transfer processes in rocket combustion-chambers, together with a survey of techniques for measuring rates of flow of heat and examples of typical data. It concludes with a discussion of the ways in which the techniques of external liquid cooling, internal gas and liquid film cooling, and low-conductivity refractory liners, may be used to effect an engineering solution to the problem of protecting rocket chambers against heat.

Part II begins with a study of the phenomenon of convection to liquids at high heat-transfer intensities, discussing in detail the boiling process and the influence of fluid pressure; it is shown that the high rate of removal of heat during nucleate boiling can be explained by detailed study of bubble dynamics. Next, an exposition is given of the techniques in which a layer of fluid lines the interior of the combustion chamber—the so-called transpiration or film cooling method; equations are established for the thermal and mechanical parameters of such films and are correlated with experimental data.

Finally, a new method of describing the turbulent shear stress in the boundary layer is used to develop a relationship for the heat-transfer coefficient for turbulent fluid flow. It is shown that the new theory is an improvement over existing theories and that it can be extended to take into account the variation of physical properties in the boundary layer of the heat-transfer fluid.

Some Aerodynamic Advances.

By A. FAGE, *Superintendent, Aerodynamics Division, National Physical Laboratory.*

The paper deals briefly with recent advances that have been made in studies of some aerodynamic problems and illustrates in broad outline the trend of research work on them. Methods of calculating aerofoil characteristics in two-dimensional flow are considered, and an example is given of the systematization of experimental-section data by relating them to corresponding theoretical quantities. A review of methods used for calculating the properties of swept-back wings in steady flow is made. Attention is directed to matters of a fundamental nature arising from research work on wings in oscillatory motion, and to the need for experimental checks on the accuracy of theories used to estimate aerodynamic coefficients for oscillatory motion.

General features of aerofoil flow for both high-subsonic and supersonic speeds are considered, and in particular some observed features that differ from predictions made by theory. The dependence of shock-wave boundary-layer inter-action on the state of the boundary layer upstream of the wave system and on the Reynolds number of an aerofoil is illustrated, while brief comments are included on the progress that has been made in studies of transonic aerodynamics, boundary-layer flow (high speed), boundary-layer suction and aircraft air intakes.

Some Material Problems of High-altitude Aircraft.

By H. W. HALL, *Head of Plastics Section, Chemistry Department, Royal Aircraft Establishment, and* T. P. HUGHES, *formerly Chemistry Department, now Chief Superintendent, Rocket Propulsion Department, Royal Aircraft Establishment.*

The high speed and increased operating height and range of modern civil and military aircraft have imposed more difficult operating conditions on aircraft materials. This paper surveys some of the problems encountered with non-metallic materials in aircraft, including fuels and other fluids, optical and electrical transparencies, rubbers and protective coatings.

Greatest attention is given to recent studies of the shortcomings of acrylic polymers as optical transparencies; in particular, the nature of "crazing" is discussed. The relation between molecular structure of the material and mechanical properties is explained and methods of overcoming inherent difficulties of the plastic as used for aircraft canopies are outlined.

The Aerodynamics of Low-Aspect Ratio Wings and Wing-Body Combinations.

By A. H. FLAX (*Head*), *and* H. R. LAWRENCE (*Assistant Head*), *of the Aerodynamics Research Department, Cornell Aeronautical Laboratory.*

The determination of the aerodynamic characteristics of low-aspect-ratio wings is considered. Because the curves of lift and pitching moment for such wings show marked non-linear variation with angle of attack, linear lifting-surface theory cannot solve the problem, but it is shown that the predictions of linear theory are in good agreement with experiment at small angles of attack. It is concluded that a proper approach is to use linear theory as a basis and to determine suitable additional correction terms for the non-linear effects. Since exact solutions of the lifting-surface integral equation are almost non-existent,

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and since numerical solutions tend to be laborious, approximations to the lifting-surface equation appropriate to low-aspect-ratio plan forms are investigated. These approximations reduce the two-variable integral equation of lifting-surface theory to a one-variable approximate integral equation. The analogy between the low-aspect-ratio approximations and the well-known high-aspect-ratio approximations of Prandtl and Weissinger is brought out by deriving them all from a common point of view. Comparison of the theoretical lift, moment and pressure distribution with experimental results for rectangular and delta wings shows satisfactory agreement.

The various available theories and empirical methods for predicting non-linear effects on lift are next reviewed and compared with experiment. None of these theories or methods deals with pitching moment. It is found that all the theories and methods either show poor correlation with experiment for all low-aspect-ratio wings, or agree with experiment for only one type of wing. From a study of experimental data and some related theoretical work it is concluded that viscous effects on the suction side of the wing probably account for the major non-linear effects. The approach adopted to account for these effects is to add to the linear theory the effects of viscous cross-flow in planes transverse to the longitudinal axis of the wing. Comparison of theoretical results for lift and moment with experiments for rectangular delta and trapezoidal wings having various cross-sectional shapes shows good agreement.

Some Research on High-speed Flutter.

By I. E. GARRICK, *Chief of the Dynamic Loads Division, Langley Aeronautical Laboratory.*

Various items of research relating to high-speed flutter are discussed briefly and, taken together, illustrate the thesis that a many-sided attack is required for the flutter field, and that methods and criteria should be tailored to phenomena. The topics touched on are (*a*) oscillating air forces for M = 1.0; (*b*) indicial functions; (*c*) oscillating pressure fields near airscrew tips; (*d*) cantilever wing flutter for high speeds; (*e*) flutter of a wing with concentrated weights; (*f*) flutter testing with the aid of rocket vehicles; (*g*) consideration of free body modes and bending stiffness; (*h*) wing flutter for M = 1.3; (*i*) use of variable-medium testing; and (*j*) airscrew-stall flutter.

Appendices contain reference material on static aeroelasticity and analytical results for wings of very small aspect-ratio.

Engineering Problems of Aircraft Operation.

By B. S. SHENSTONE, *Chief Engineer, British European Airways.*

Airline engineering problems are considered in a general way from the viewpoints of development, maintenance and other problems.

The desirability of a development staff is considered, and its work is discussed. The importance of improving aircraft by maintenance and modification, and not only keeping them as good as when manufactured, is stressed. The advantages of having only one base are emphasized, as is the necessity for putting maintenance on a production basis like that of a factory. Modern trends in overhaul are mentioned and the pros and cons of outside contract work discussed.

Various methods of inspection are briefly described and the problem of engineering standards is considered, with particular emphasis on the outstations problem. The paper concludes with a discussion of the maintenance of stand-by aircraft, and—what is considered the most difficult problem—that of minor unserviceability which delays departures.

Dynamic Stability and Control Research.

By WILLIAM MILLIKEN, JR., *Manager, Flight Research Department, Cornell Aeronautical Laboratory.*

A survey of dynamic stability and control research in the United States is presented to indicate the overall developments and progress of recent years. While primary emphasis is placed on methods and techniques, typical results are shown and the more important references are cited.

The subject matter is divided into nine technical sections dealing with ramifications of full-scale dynamic response-measurements for both control and gust inputs, the prediction of dynamic characteristics, the use of artificial stability in relation to the establishment of rational handling-qualities specifications, and, finally, such special problems as the stall, the phugoid and spiral modes.

It is concluded that, while a great variety of dynamic research is under way, and progress is being made in devising theoretical and experimental methods for acquiring dynamic data, much remains to be accomplished. While final conclusions cannot be drawn on many of the more technical questions, largely because of the incomplete or exploratory state of the work, there is every evidence that the general results of dynamic research are proving of worth to industry, particularly in connection with automatic and specialized artificial control design. The effects of the rapid growth of dynamic research activity are noted, and the suggestion is made that additional surveys and more extensive long-range planning are indicated in specific segments of the field.

An Experimental Study of the Static Stiffness and Deformation of Swept Wings with Uniform Chord.

By A. H. HALL, *Research Officer, Structures Laboratory, National Research Council, Canada.*

The paper contains the results of tests made on the effect of sweep on overall wing stiffness and deformation. The following aspects of sweep are included: (*a*) effective length for estimating wing torsional stiffness; (*b*) effect of rib direction on torsional stiffness per unit length; (*c*) effect of aspect ratio, rib direction and structural length on bending stiffness; (*d*) twist due to bending; (*e*) bending and twist due to distributed loads; (*f*) an approximate extension to the estimate of bending stiffness for tapered wings.

The eleven cellulose-acetate models used covered angles of sweep from —15 deg to 60 deg in 15 deg increments, each angle being associated with two models having, respectively, ribs normal to the leading edge and ribs parallel to the air stream.

The tests described were limited to semi-span wings of uniform chord; it is hoped later to extend the investigation to tapered full-span models.

The Influence of Size on the Performance of Turbo-Jet Engines.

By S. J. MOYES *and* W. A. PENNINGTON, *Projects and Performance Department, National Gas Turbine Establishment.*

The purpose of the paper is to show how the specific performance of a given design, *i.e.*, its weight per unit thrust and fuel consumption per unit thrust, can be affected by change of engine size. It is explained how the influence of size on engine performance arises due to Reynolds number effects and from mechanical-design considerations. At present, the basic data available to assess these effects rests upon somewhat scanty experimental evidence and experience, and modification to the results obtained is likely as further and more systematic data accrues.

In the analysis, the performance of a family of engines of similar design, covering a range of size, is considered, with allowance made for the effect of Reynolds number upon blade losses. In addition to deriving the performance of each engine, certain assumptions are made which enable the weight of each to be calculated. Thus for any size of engine within the range considered, both its weight and performance may be predicted. The calculations are made to cover a number of typical flight conditions.

On the basis of the tentative assumptions made, the results indicate that for a given application there is likely to be an optimum size of engine, or at least an optimum range of engine sizes, of given basic design, which will yield the lowest total engine plus fuel weight, it being assumed that the number of engines per aircraft is disposable. This optimum size can vary widely according to the flight requirements.

Experimental Methods for Transonic Research.

By JOHN STACK, *Chief of Research, Langley Aeronautical Laboratory.*

The paper describes experimental methods for investigating the transonic region, rendered necessary by the inability of theory to describe flow fluctuations caused by shock-wave and boundary-layer inter-action. Results of dropped-body tests, aided by advances in electronics, and of tests on rocket-propelled models are discussed, together with "wing flow" and "bump" techniques. The rotating-disc method is described, together with new support systems in wind tunnels, nozzle design, and the open-throat tunnel, for reducing the choking range. The co-operative venture of the U.S. Navy, Air Force and aircraft manufacturers in producing special transonic research aircraft is discussed.

The paper ends with a comparison of results obtained by the different methods and concludes that, with the possible exception of the "bump" technique with wing-fuselage combinations agreement is good, in spite of large differences in Reynolds number.

I.A.T.A.—PARLIAMENT OF THE WORLD'S AIRLINES (*concluded from page 279*)

other documents. Conditions of carriage have been revised and a standard system of inter-line agreement drawn up. In the technical field, I.A.T.A. has been responsible for a large measure of standardization in operating procedures between the airlines. Among other things, it has also played an important part in securing for aviation a fair share of communication wavelengths in the face of heavy demands from other radio-users. The association's interest in the legal and financial spheres has brought about such worthy results as the reconciliation of American and European transport law and a standard set of revenue and expenditure tables. Its Medical Committee, also, has done much to relieve air travellers of tiresome health restrictions at frontiers.

More recently an Enforcement Division was established which acts, in effect, as a police agency, and has the power to levy fines or even recommend dismissal from membership of the Association.

One of I.A.T.A.'s most notable achievements has, undoubtedly, been the creation of its London Clearing House which, by offsetting currency transactions, has enabled international airlines to eliminate cash settlements on all but a very small proportion of their turnover. In 1950 the offset ratio was as high as 84 per cent. The success of this venture in connection with European routes has paved the way for the introduction of a similar experiment on the North Atlantic services.

At present, I.A.T.A. has a total of 62 members who, between them, carry 95 per cent of the world's scheduled international traffic. They have made the Association responsible, on their behalf, for unifying and simplifying all phases of airline operation. They have also virtually made I.A.T.A. their own "foreign office" through which their views may be represented to international organizations such as I.C.A.O., the Universal Postal Union and International Telecommunications Union.

The forthcoming assembly will be attended by more than 150 delegates and observers from member airlines, governments and similar agencies. For the most part the airline delegates will be chief executives. Prominent personalities are too numerous to mention here, but they include many of air transport's surviving pioneers and several former presidents of the Association.

There is little doubt that I.A.T.A. represents one of the finest attempts at international co-operation, whose success has in many ways been due to the all-pervading aura of friendliness which seems to surround flying people the world over. This, we feel sure, is a phenomenon which will be convincingly apparent at next week's Annual General Meeting.

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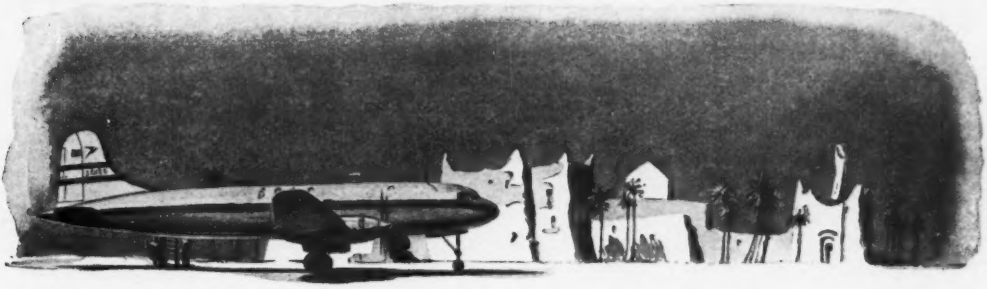

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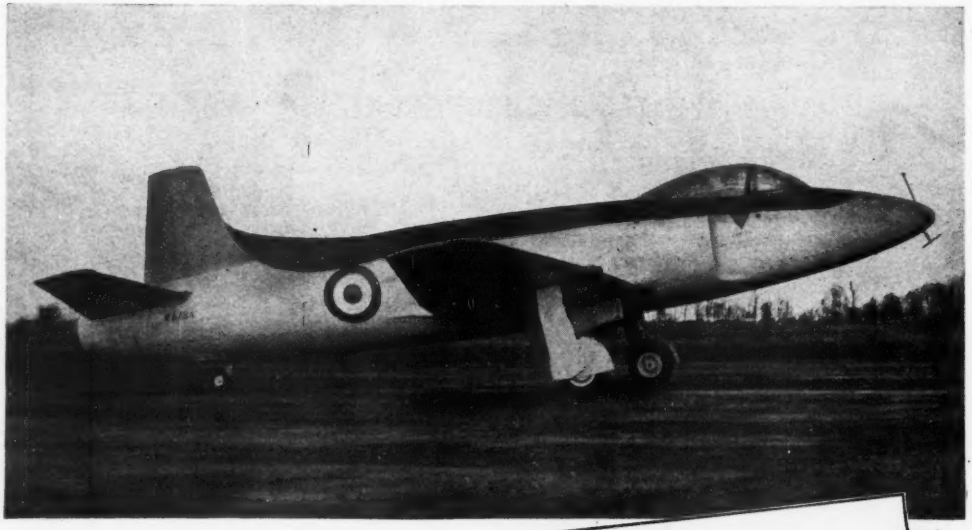

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BRITISH AIRCRAFT, 1951

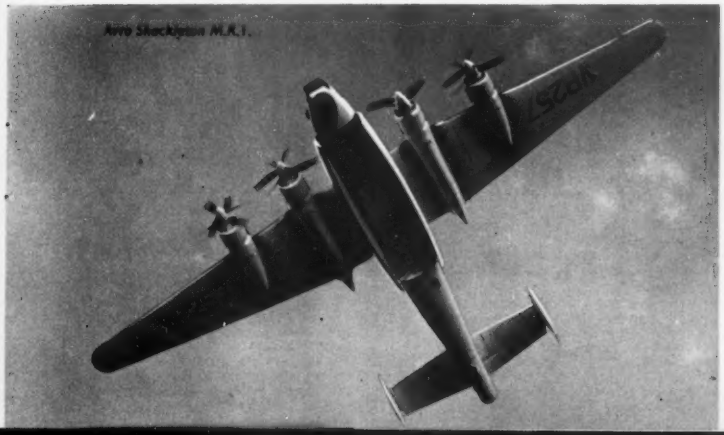
Armstrong Whitworth (Gloster) Meteor N.F.11.

ANOMALOUS as it might seem, it would be something of a disappointment if this annual survey of British aircraft were to prove a complete guide to types in the S.B.A.C. Display, for at the moment of writing some notable last-minute additions to the declared list of participants appear probable, and a spice of expectancy is thereby added to the proceedings. But, whatever dark horses may arrive at the last moment, the showing in the following pages is a brave one, surpassing that of a year ago in including two four-jet bombers (Vickers Valiant and Short S.A./4), and two new single-seat intercepter fighters (Hawker P.1067 and Vickers-Supermarine Swift). Each of these fighters has been designed to exploit to the utmost advantage the latest types of axial-flow turbojet. Three distinct delta-wing types (Avro 707, Boulton Paul P.111, and Fairey F.D.1), are evidence of Britain's firm resolve to enhance her position in respect of aerodynamic design. The photographs illustrating this review have been carefully selected to display the salient features of each type. Tabulated data will be found on pages 338 and 339.

MILITARY

Avro Shackleton

NOW firmly established in service with R.A.F. Coastal Command, this large maritime-reconnaissance landplane (four Rolls-Royce Griffon engines) was developed to embody many of the design features of its illustrious forebears, the Lancaster and Lincoln bombers, but to provide special facilities for over-water flights of very long duration. Armament of the current M.R.1 version is two 20 mm guns in a Bristol dorsal turret, but provision was made in the basic design for the installation of two additional guns of the same calibre in forward barbettes. As the photograph below will prove, the bomb bay is of truly vast capacity. Special anti-submarine weapons, or an airborne lifeboat, are readily accommodated. A crew of ten is normal, and the galley is proving an especially popular feature on long patrols. Performance details are withheld, but it may be said that a high rate of climb is attainable in order that the aircraft may clear the target area quickly after a surface attack. In the event of one or two Griffons being put out of action the Shackleton can return to base on the remaining two. Addressing workers at the Avro factory in March this year, the A.O.C.-in-C., Coastal Command, said: "The Shackleton is an aeroplane we need. It can carry everything we want. Give us more Shackletons."



Armstrong Whitworth (Gloster) Meteor N.F.11

ADOPTED as the standard night fighter of the R.A.F., in succession to the D.H. Mosquito, the Meteor N.F.11 (two Rolls-Royce Derwent turbojets) is a development of the Mk 7 trainer and Mk 8 fighter, and embodies a wing of 43ft span. Due to the installation of a radar scanner, the fuselage is even longer than that of the Mk 7 trainer. Four electrically fired 20 mm British Hispano guns are located outboard of the turbojet nacelles, and, in addition to extensive fuselage tankage, there are ventral and underwing tanks disposed as the photograph shows. The massive cockpit enclosure can be jettisoned by either of the crew of two, each of whom has a Martin-Baker ejector seat. It has been stated that the N.F.11 is destined to become "the backbone of Western European night defences."

Auster Model S air observation post.

Auster Model S

NO FIRM in the British aircraft industry can rival the experience of Auster Aircraft, Ltd., in the design of light aircraft for "air-observation-post" duties. Latest of the A.O.P. series, the Model S originated as a private venture and is the company's own interpretation of the British Army's requirements as laid down in the appropriate specification. The span (32ft) is 4ft less than that of the familiar A.O.P.6, and the engine—a Cirrus Bombardier 702—gives appreciably more power than the Gipsy Major standardized in that model. Performance and handling tests are reported amply to justify the estimates put forward by the makers.

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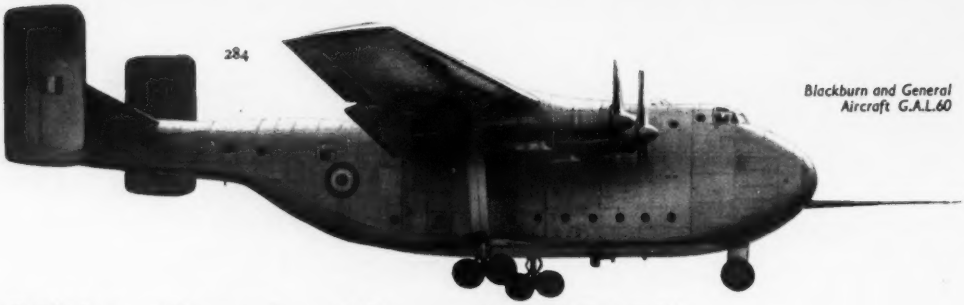


Blackburn and General Aircraft G.A.L.60

British Aircraft, 1951 — MILITARY . . .

Avro Canada CF-100

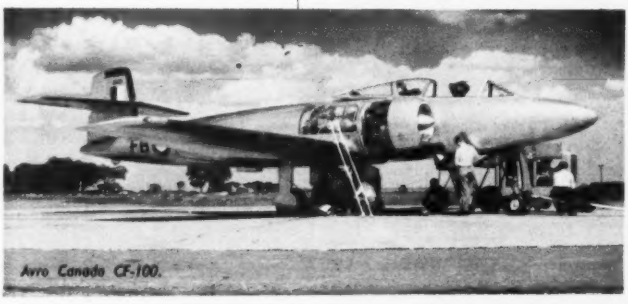
A TWIN-JET long-range, all-weather fighter of exceptional quality, the CF-100, with its power plant, the Orenda turbojet, is being prepared for quantity production for the Royal Canadian Air Force. Performance and armament data are secret, but the range is claimed by the makers to be sufficient to allow a non-stop Atlantic crossing with ease, and it has been unofficially stated that a battery of four 30 mm guns comprises the primary armament. Reference to "special" weapons has lately been made. Rate of climb and manœuvrability at height are reported to be outstandingly good. Its short take-off run, and special equipment and facilities, render the CF-100 particularly suitable for Arctic warfare.

Blackburn and General Aircraft G.A.L.60

SINCE its first public appearance a year ago the G.A.L.60 military transport (four Bristol Hercules engines) has rendered a highly promising account of itself on makers trials and in demonstrations for the military authorities. During the year a notable improvement was made by the installation of a bogie main undercarriage. It was lately revealed in the House of Commons that the G.A.L.60 "sailed gently" into Watchfield (a small grass field) with its load of military equipment, landed in 300 yd, unloaded and returned to its base; other established types of military transport did not attempt a similar performance. It may be noted that the G.A.L.60 is the first British transport designed for the airborne supply role, and has proved itself capable of dropping guns and vehicles with the utmost ease. The nosewheel undercarriage allows the floor to remain more or less level under all conditions.

Blackburn and General Aircraft Y.B.1

A COMPACT and ingeniously designed deck-landing anti-submarine aircraft, the Y.B.1 is powered with an Armstrong Siddeley Double Mamba turboprop. Since its appearance in the S.B.A.C. Display last year the span has been increased with, it is understood, appreciable benefit to the endurance and take-off.



Avro Canada CF-100.

Commonwealth CA-22.

Boulton Paul Balliol

QUANTITY production of the Balliol T.2 advanced trainer (Rolls-Royce Merlin 35) is already well under way at the Boulton Paul factory. It was announced during April that a development of this type, designated Sea Balliol T.21, has been ordered for the Royal Navy. This deck-landing version incorporates an arrester hook, an airscrew of smaller diameter, new undercarriage units and various alterations in equipment and instrumentation. The control characteristics of the Balliol at low approach speeds are claimed to render it particularly suitable for deck-landing instruction and practice, while the air brakes permit its employment for training in low-level bombing attacks. The structure of the Balliol and Sea Balliol is built in easily transportable units, and robustness and ease of maintenance were given special consideration at the design stage.

Commonwealth CA-22

OUTWARDLY resembling British machines designed for similar duties, this Australian-designed-and-built trainer is intended for the new Cicada engine.

Blackburn and General Aircraft Y.B.1.

Boulton Paul Sea Balliol T.21

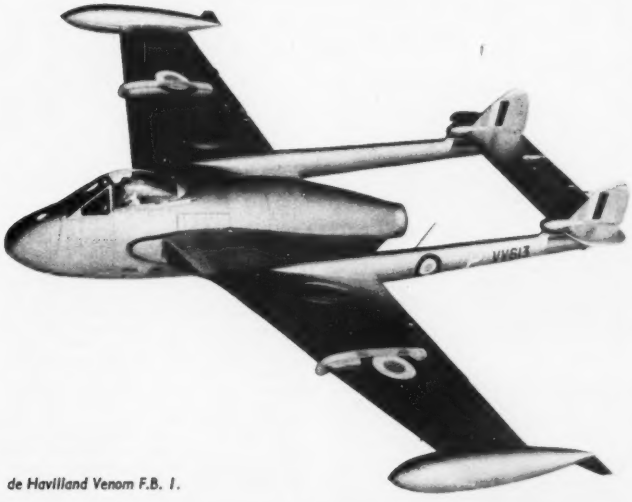
de Havilland Vampire

A MOST impressive number of variants of this single-jet fighter are in service or under development. Representative of these are the F.B.5, standardized by the R.A.F.; F.B.6, with Goblin 3, for Switzerland; Swedish F.B.50; Sea Vampire F.20; Vampire N.F.10 night fighter, and Vampire Trainer. An adaptation of the Sea Vampire has been utilized for experimental "undercarriageless" landings on a specially prepared deck. The Trainer has benefited (as did the N.F.20 in relation to the Mosquito night fighter) from experience gained with the Mosquito trainer; but the Trainer shows a wider deviation, internally and externally, from the pattern of the Mosquito than does the N.F.10. As observed in our detailed description of the Trainer (November 23rd, 1950), the description "all-purpose" is well deserved. In addition to training in gun-, rocket- and bomb-sighting, air combat and fighter navigation, the machine is eminently suitable for employment as an advanced trainer and for the increasingly important work of jet conversion. For practice ground-attack duties with eight 25 lb R.P.s, a practical radius of action of 100 nautical miles at 5,000ft is achieved, whilst leaving an ample fuel margin at the end of the flight. At a Mach number of 0.7 at 40,000ft the radius of steady turn is 1.95 nautical miles.

de Havilland Vampire Trainer.

de Havilland Venom

ESSENTIALLY, the Venom differs from the Vampire in having a thinner wing, with a moderate sweepback on the leading edge, and in being powered by the Ghost turbojet—some 66 per cent more powerful than the Goblin standardized in the Vampire, though fitting into the same fuselage diameter. A notable innovation is the adoption of wing-tip fuel tanks which can be jettisoned if necessary though the wing is stressed to allow full manœuvrability with the tanks full, thus avoiding the necessity of jettisoning (should the tanks still contain fuel) before entering combat. Variants of the Venom so far disclosed are the F.B.1 fighter/bomber, first deliveries of which are being made to the R.A.F.; the N.F.2 two-seater night fighter; and the Sea Venom N.F.20—a deck-landing version of the N.F.20. A Venom experimentally equipped with an afterburner is scheduled to appear in the Display this year. With this fitment the rate of climb—already exceptionally high—should be greatly enhanced.



de Havilland Venom F.B. 1.

de Havilland Chipmunk.

de Havilland Sea Venom N.F.20.

de Havilland Chipmunk

THIS Gipsy Major-powered monoplane is fast succeeding the Tiger Moth biplane in formations of the Royal Air Force Volunteer Reserve. The adoption of metal, instead of wooden, construction ensures that repair and maintenance technique will be in line with that employed for other modern aircraft. The manufacturers emphasize that the Chipmunk T.10 as supplied to the British Service should be considered as a variant of a basic airframe to meet the requirements of a particular user. The type is readily adaptable to meet specific requirements.

de Havilland Hornet

OUTSTANDING among the world's piston-engined military aircraft, the Hornet and Sea Hornet (two Rolls-Royce Merlin) combine very high speed and outstanding manœuvrability with long range. Variants include the F.20 fighter, N.F.21 deck-landing two-seat night fighter/strike leader, and P.R.22 photographic reconnaissance aircraft.

British Aircraft, 1951 —MILITARY...

English Electric Canberra

THE manifold virtues of this twin-jet, multi-purpose military aircraft have been apparent at former Farnborough Displays and in its record Atlantic crossing. Current variants are the B.2 tactical bomber, the P.R.3 for high-altitude reconnaissance, and the B.5 for target indication. Under the designation B-57 the type is being quantity produced in America for night intruder work. This last-named version, like the Canberra due to appear in the "fast circus" this year, is powered by Armstrong Siddeley Sapphires instead of the Rolls-Royce Avons standardized by the R.A.F.

Fairey Firefly

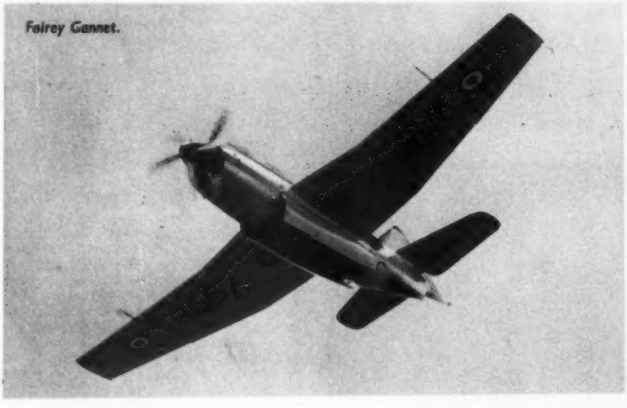
THE latest Firefly (Mk 7), is an anti-submarine three-seater, differing from its multi-purpose predecessors in having a different Griffon power plant; elliptical wings, without radiators; and a new rear cockpit for two operators. Provision is made for radio and radar appropriate to the latest anti-submarine techniques.

English Electric Canberra B.2.

Fairey Firefly A.S.7.

Fairey Gannet

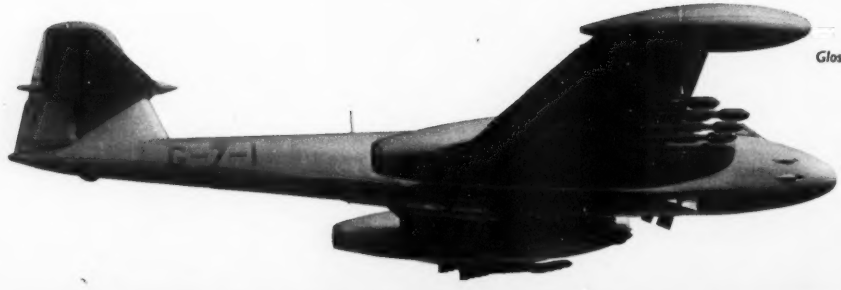
FORMERLY known as the Fairey 17, this carrier-borne anti-submarine aircraft has now been ordered by the Ministry of Supply on behalf of the Admiralty and has been named as above. The Gannet was the first turboprop aircraft to alight on a carrier's deck, and provides a rare instance of an entirely new power plant and a new airframe having been successfully wedded and ordered directly for quantity production. In normal cruising flight either of the two elements of the Armstrong Siddeley Double Mamba can be stopped, the stationary airscrew being feathered to minimize drag.



Fairey Gannet.

Gloster Meteor

THE principal variants of the Meteor have a place in the data table on page 338. Newest of these is the private-venture, tactical ground-attack fighter, capable of carrying four 1,000-lb bombs or formidable combinations of bombs, R.P. and gun armament. Extra fuel is carried in wing-tip tanks, and provision is made for rocket-assisted take-off for operation at full load from forward or improvised airfields. For use with suitable ground-arrester gear the design allows for the fitment of a special hook. In the "clean" condition the P.V. Meteor is hardly distinguishable from the now-familiar Mk 8.



Gloster P.V. Meteor.

Handley Page (Reading) H.P.R.2.

Percival Provost T.1.

Handley Page Hastings

Handley Page Hastings

RECENT marks of this fast, long-range military transport (four Bristol Hercules engines) are the C.2, as employed by R.A.F. Transport Command; the Met. 1, used for meteorological reconnaissance duties by Coastal Command; and the C.3, as adopted for the re-equipment of the Royal New Zealand Air Force. The C.3 differs from other versions in having Hercules 737 engines and, like the C.2, flies at a gross weight of 80,000 lb, whereas the gross weight of the C.1 is 78,000 lb. Maximum continuous cruising speed of the C.3 is 308 m.p.h. at 6,000 ft., and the take-off run, at gross weight, 1,337 yards.

Handley Page (Reading) H.P.R.2

DESIGNED to operate efficiently with the minimum of servicing, this basic trainer has been flown with both the 420 h.p. Armstrong Siddeley Cheetah 18 and the 550 h.p. Alvis Leonides 502/4 engines. The cockpit, with side-by-side seating, is unusually roomy and is enclosed by an electrically operated canopy. Easy access to most components is afforded by removable panels. Those in the under-surface of the fuselage enable maintenance personnel to service all instruments, general services and controls from outside the cockpit. Interchangeability of components is a strong point.

Hawker P.1067

THOUGH bearing a strong family resemblance to its precursors (P.1040, Sea Hawk, P.1052 and P.1081) the P.1067 intercepter is a distinct type. It is claimed to be superior in performance to the American Sabre and Russian Mig-15 and has been ordered in quantity for the re-equipment of R.A.F. squadrons. The power unit—a Rolls-Royce Avon—is fed from intakes at the roots of the back-swept mainplanes.

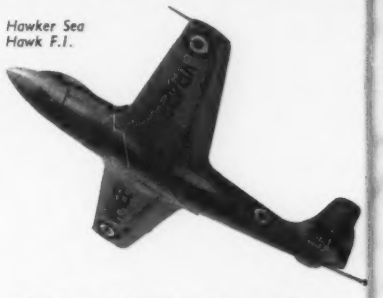
Hawker Sea Hawk

DESTINED to become the standard single-seater fighter in the service of British Naval Aviation, the Nene-powered Sea Hawk embodies the Hawker bifurcated jet-pipe system and is claimed by the makers to carry an exceptional quantity of fuel in fuselage tanks fore and aft of the power plant. Endurance can be further increased by the addition of two 90-gallon wing tanks.

Percival Provost

ADOPTED by the Royal Air Force after severe competitive trials, the Provost T.1 basic trainer, with Alvis Leonides 25 engine (the Armstrong Siddeley Cheetah 18 is an alternative) is a side-by-side two-seater with fixed undercarriage. The wing has pneumatically operated slotted

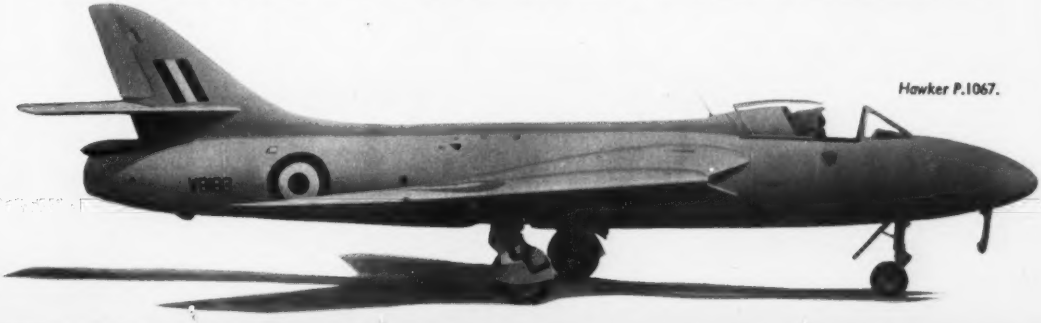
Hawker Sea Hawk F.1.



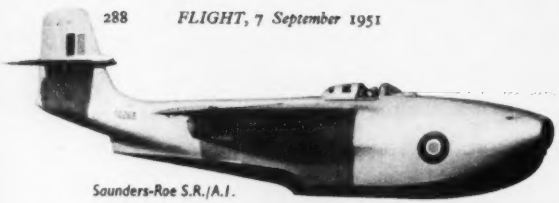
flaps and is attached directly to the fuselage by two bolts at the main spar and one at the rear spar; the tips are detachable. The fuselage has large hinged panels for access to accumulators, radio, controls and other equipment, and the fixed oleo-pneumatic undercarriage legs are readily detachable for replacement.

Percival Prince (Military)

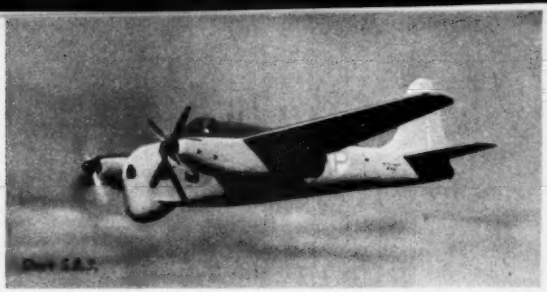
SEVERAL military variants of the Prince light transport (p. 295) are being developed for diverse duties. First of these is the Sea Prince T.1 flying classroom for the Royal Navy. The Sea Prince C.2 is being supplied as a communications aircraft.

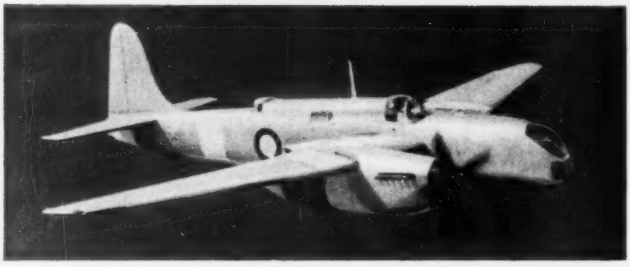


Hawker P.1067.



Saunders-Roe S.R./A.1.





Saunders-Roe S.R./A.1

ENCOURAGED by the results of tests with this unique jet-propelled fighter flying-boat, Saunders-Roe, Ltd., have prepared designs for more advanced types, one of which was represented by a drawing displayed at Farnborough a year ago. The design depicted had swept wing and tail surfaces, a faired step, and lateral stabilizing floats retracting on to the wing tips. Tests with the Beryl-powered S.R./A.1 continue, though there is no prospect of this type being put into production in its present form.

Short Sturgeon

CARRYING a crew of two—the pilot and a navigator/wireless-, target-, or camera-operator—the Sturgeon T.T.2, as supplied to the Royal Navy, is capable of undertaking target-towing for ground-to-air firing practice, photographic marking, target-towing for air-to-air firing practice by day and night, "throw-off" target practice and marking, and radar calibration. Many ingenious design features are incorporated, notably in respect of wing folding. Under the action of a hydraulic jack the wings sweep downwards and backwards in a manner reminiscent of that in which a swimmer completes the backward sweep of the arms in the breast stroke.

Vickers-Supermarine Attacker F.1.

British Aircraft, 1951—MILITARY...

Short S.B.3

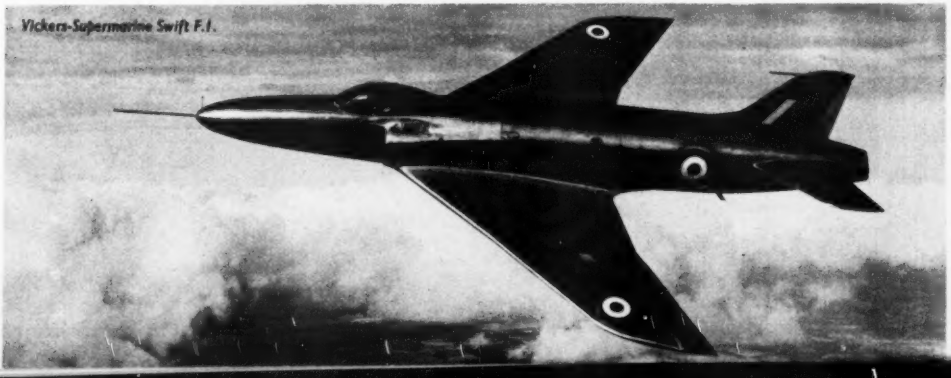
THIS carrier-borne anti-submarine aircraft is a direct development of the Sturgeon. The type first appeared in public at the S.B.A.C. Display last year and demonstrated a lively performance. It differs essentially from the Sturgeon in being fitted with Armstrong Siddeley Mamba turboprops in place of the Rolls-Royce Merlin piston engines, and in having a nose of completely revised design, incorporating observation windows and an underslung radar housing. The rear cockpit has been eliminated. No mention of performance or armament is allowed, but it may be recalled that in the Sturgeon Mk 1, from which the T.T.2 described above was developed, internal provision was made for bombs and depth charges. The range should be more than adequate for the intended duties.

Short S.A./4

THE first Short bomber since the pre-war Stirling is the S.A./4, powered with four Rolls-Royce Avon turbojets. The maiden flight was on August 10th. A crew of five is carried and it will be judged from the photograph that the fuselage affords an exceptional large stowage capacity. Notable design features include the superimposition of one Avon above another, in each of the massive wing-mounted nacelles, and the eight-wheel bogie main undercarriage. The wing is not swept back but is extremely thin. It will be remarked in the photograph that the nacelles are set at an angle to the fuselage centre-line and that the tailplane has been given a pronounced dihedral angle in order to clear the jet efflux. There is no evidence of armament.

Vickers-Supermarine Swift

THE Swift will have the distinction of being the R.A.F.'s first British swept-back-wing fighter and it is the first Supermarine aircraft to have been ordered for that Service since the Spitfire. Development can be traced through the straight-wing Attacker, the swept-wing Type 510, with tailwheel undercarriage, and the Type 535, with nosewheel landing gear and other improvements. In place of the Rolls-Royce Nene installed in these earlier types, the Swift has an axial-flow Rolls-Royce Avon, fed from lateral intakes flanking the cockpit. Externally there is little to distinguish the Swift from the Type 535. Perhaps the most noticeable difference is in the design of the wing-tips which, on the Swift, are distinctly rounded at the leading edge. It also appears that the air intakes are larger.



Vickers-Supermarine Swift F.1.

Vickers-Supermarine Seagull.

Vickers-Armstrongs Varsity T.1.

Vickers-Supermarine Attacker

DELIVERIES of the first Attacker deck-landing fighters to British Naval units are now well under way, and aircraft of similar type have been supplied to Pakistan. On many occasions Attackers have been flown at a Mach number of 0·825. A feature which contributes to the ease of landing is the lift-spoiler control which is used on the approach to vary the glide path. The cockpit is pressurized to a differential of 3·5 lb/sq in. Four 20 mm wing-mounted guns are supplied with 624 rounds of ammunition, and rocket projectiles or bombs up to a maximum weight of 2,000 lb may be stowed externally. The full range of fighter radio equipment, including V.H.F., I.F.F., beacon homing and radio altimeter can be fitted to suit operational requirements.

Vickers-Supermarine Seagull

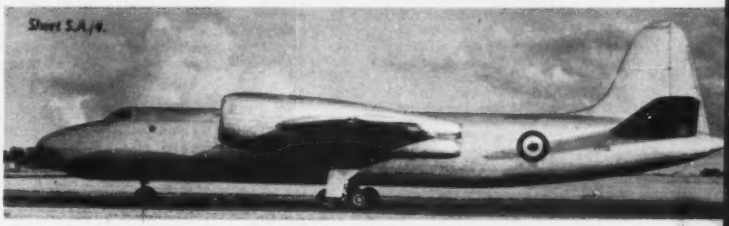
THIS remarkably clean Griffon-engined amphibian achieves an unusually wide speed range, thanks to the variable-incidence wing, with interconnected full-span leading-edge slots and slotted flaps. For take-off the wing is set at the optimum angle and in level flight is adjusted to reduce hull drag. Originally the type was intended for Naval reconnaissance and fleet spotting, though the prototypes are equipped for air/sea rescue. The type is fully equipped for carrier operation, and the wings can be folded to reduce the breadth to 23ft 6in.

Vickers-Armstrongs Valetta

VARIANTS of the Valetta are the C.1 military freight and troop transport; the C.2, a V.I.P. transport; and the T.3 flying classroom. The last-named is distinguished by six astrodomes atop the fuselage. The main cabin has a total floor area of nearly 400 sq ft and a volume of 1,565 cu ft.

Vickers-Armstrongs Varsity

AMONG numerous features which distinguish the Varsity from the Valetta is the nosewheel undercarriage. Complete facilities are provided for training in bombing, air navigation, bomb-aiming, and radio/radar work. An underslung nacelle is provided for the bomber-aimer-pupil, instructor and twenty-four 25 lb practice bombs.


Short S.A./1.

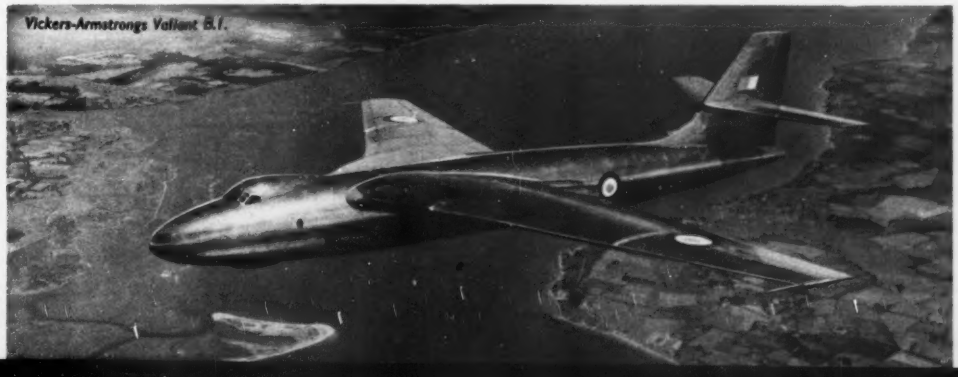
Westland Wyvern.

Vickers-Armstrongs Valiant

IF one had to choose an "aircraft of the year," that for 1951 would be the Valiant four-jet bomber. The first flight of this altogether remarkable machine was on May 18th. Regrettably, no technical details are permitted, but the Air Minister himself has given an assurance that the Valiant will be superior to the twin-jet Canberra in range, speed, altitude and load-carrying capacity. His belief that it would give our country the lead in the jet-bomber field is certainly not ill-founded. The four Rolls-Royce Avon engines are buried in the roots of the back-swept wing, and each pair is fed from a common intake. The bomb bay is of very large dimensions and the fuselage, though of superb aerodynamic form, is very roomy. Beneath the cockpit section is a "blister" fairing which may be presumed to house special radar equipment. The nosewheel undercarriage has paired main wheels, retracting into the wing.

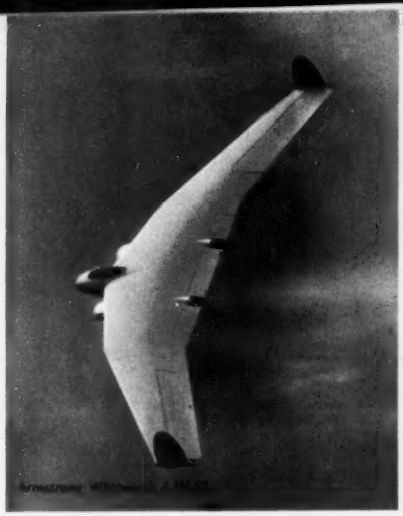
Westland Wyvern

ADOPTED by the Royal Navy as its standard single-seat deck-landing fighter, the Wyvern T.F.4 is a single-seater (a two-seater trainer version, designated T.3, has also been developed), powered with an Armstrong Siddeley Python turboprop driving an eight-blade Rotol contra-rotating airscrew. The wings can be hydraulically folded to an overall width of 18ft; they house four 20-mm guns, and beneath each, provision is made for a variety of external loads. It will be remembered that at the last S.B.A.C. Display a Wyvern went through a series of aerobatic manoeuvres while carrying a torpedo in addition to 16 rocket projectiles. In addition to the Youngman three-position flaps, split flaps (used for landing) are fitted between the Youngman flaps and the ailerons, outboard of the wing hinge. The undercarriage is unusually robust and has a track of 14ft 5in.

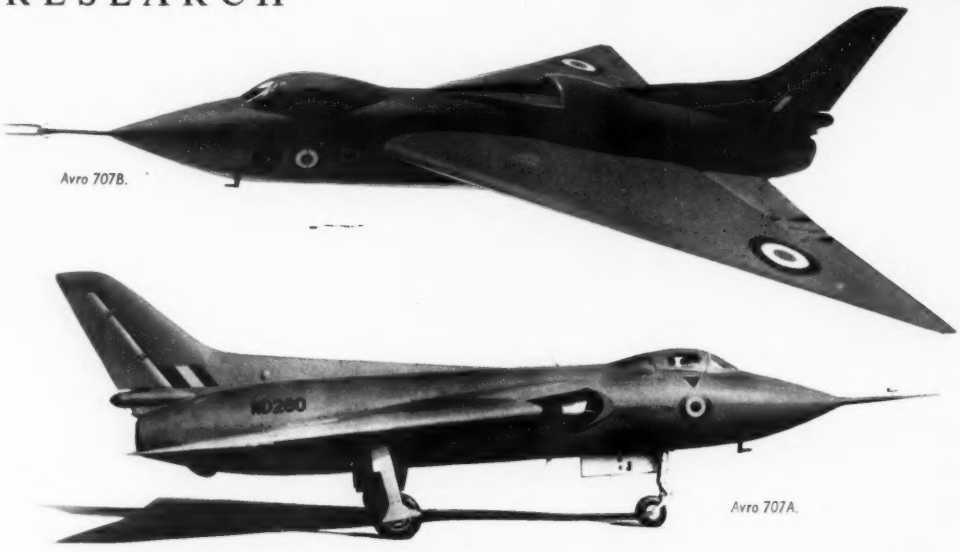

Vickers-Armstrongs Valiant B.1.

Avro 707A and B

THE Avro 707A delta-wing research aircraft is flying in two forms—the "B," intended for relatively low-speed research and having a dorsal intake for the Rolls-Royce Derwent turbojet, and the "A," capable of higher speeds and being distinguished by wing-root intakes and other improvements. Dramatic performances from one or both these types are expected at Farnborough next week. It should be remembered that all deltas are likely to suffer to some degree from lack of damping in pitch (there being no horizontal stabilizing surface placed well aft of the c.g.) and this, naturally, has a bearing on almost all flying manœuvres, particularly on stalling and spinning and possibly when flying near the limiting Mach numbers. The absence of unpleasant tendencies in the Avro 707, however, will, we believe, be readily apparent in the flying demonstrations. The wing of the 707A differs in structure from that of the B to accommodate the intake ducts, and carries boundary layer fences at the roots. The root profile is very different, as are the controls. Ailerons are positioned nearer the wing-tip—itself modified—and are slightly smaller in area. There is a new control (in place of the inboard portion of the elevators of the B) which is basically a flap, to assist trim and dive recovery, but which may be considered alternatively as an auxiliary elevator surface. No powered controls have so far been fitted, and these will probably prove unnecessary on ailerons and rudder.



British Aircraft, 1951 . . .
RESEARCH



Avro 707B.

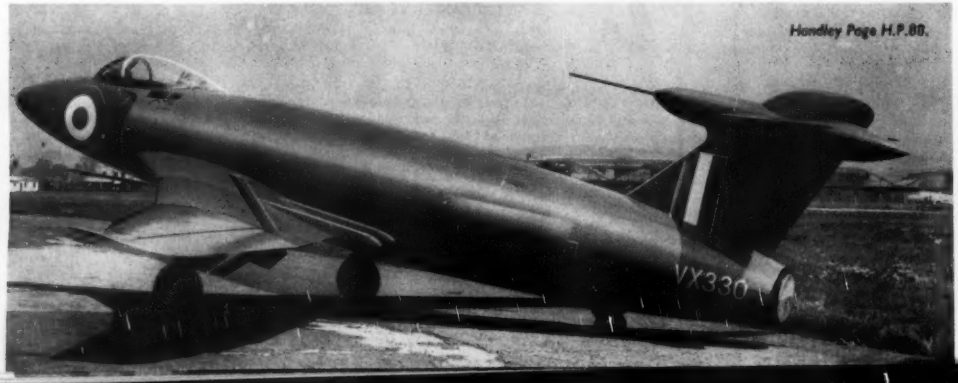
Avro 707A.

Armstrong Whitworth A.W.52

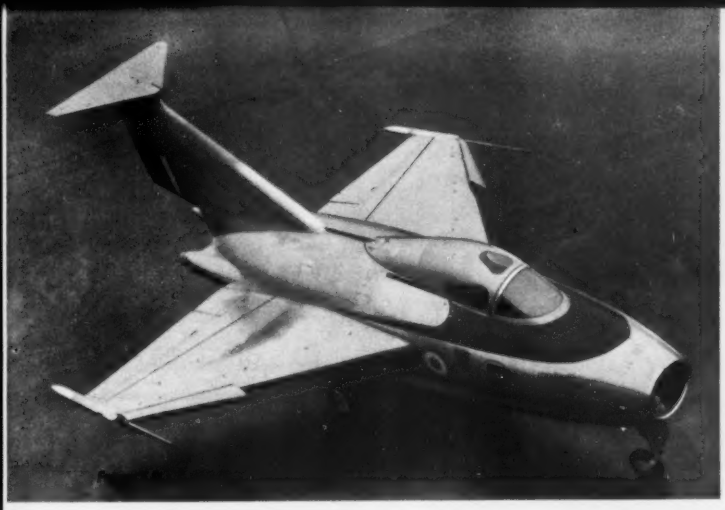
ALTHOUGH this aircraft is by no means new and will not be represented at Farnborough, it is included in these pages as an example of the bold research policy pursued in this country since the war and as a contrast to the delta-wing types with which it is so often confused.

Handley Page H.P.88

AS these pages were being prepared for press, news was received that this crescent- or scimitar-wing, research aircraft had been destroyed in a crash, having completed between 20 and 30 test flights. Its primary purpose was the testing of a new Handley Page wing form, the outboard sections of which were less sharply swept-back than the inboard portions. The aircraft was jointly the work of Handley Page, Ltd., and Blackburn and General Aircraft, Ltd., and the fuselage was essentially that of a Supermarine 510. A Rolls-Royce Nene turbojet provided power. The large flap guides visible in the view reproduced below suggest a special form of trailing-edge flap.



Handley Page H.P.88.



Fairy F.D.1

THE smallest aircraft in Great Britain (span 19ft 6½in), the F.D.1 is a pure-delta research aircraft. The tailplane and wing slots have been fitted only for initial flight trials and will be removed after flying experience has been gained. It has been stated by the makers that the type has been designed for "important research work with revolutionary possibilities in the design and operation of fighter aircraft." The prominent tail fairings may be presumed to house rockets which would supplement the thrust of the Rolls-Royce Derwent turbojet. It is emphasized by the Fairey company that the delta configuration gives the low drag characteristics necessary for very high speeds, together with a light stiff wing structure and—what they consider most important—stowage space for fuel, armament, etc., within the wing profile. The wing-tip excrescences seen in the photograph house parachutes.

Boulton Paul P.111

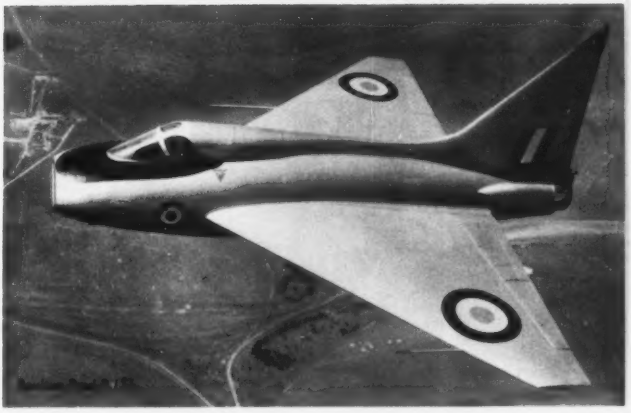
POWERED by a Rolls-Royce Nene, this delta-wing machine is intended for high-speed aerodynamic research. The fuselage is of unusual breadth at its forward end, where, in the extreme nose, the flat, oval-shaped intake is positioned. No particulars of construction or performance are authorized, but photographs suggest that the control surfaces are of unusual interest.

Vickers-Armstrongs Tay-Viscount

THE first, and so far the only, British aircraft to have been powered with the Rolls-Royce Tay centrifugal turbojet, delivering well over 6,000 lb static thrust, the Tay-Viscount makes use of the earlier type of Viscount airframe (wing span 89ft, fuselage length 74ft 6in). Only one aircraft of the type has been built, and this made its debut at the S.B.A.C. Display last year, where it demonstrated a most impressive rate of climb.

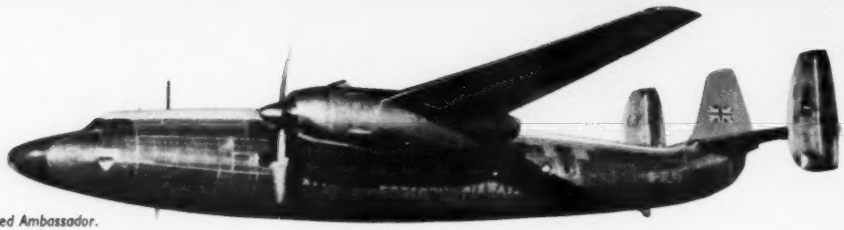
Avro Ashton

THE purpose underlying the development of the Avro Ashton high-altitude research aircraft (four Rolls-Royce Nenes), six examples of which have been ordered by the Ministry of Supply, has been summarized by Sir Roy Dobson, in the following terms: "Hitherto, high-altitude research has been confined mainly to small aircraft of fighter size in which it was impossible to install and inspect all the complicated flight reporting instruments. Free movement was hindered by the necessity of wearing oxygen masks. The Ashton is a flying laboratory big enough to hold all the instruments we require, and the pressurized cabin makes it possible for the engineers to stay aloft for long periods in comfort.



(Above) *Vickers-Armstrongs Tay-Viscount.*

Avro Ashton.



Airspeed Ambassador.

British Aircraft, 1951 . . . CIVIL

Armstrong Whitworth Apollo.

Airspeed Ambassador

BY the time these words are in print, the first Ambassador (Elizabethan class) should be in the hands of British European Airways. Indicative of the performance to be expected from this very clean high-wing monoplane (two Bristol Centaurus) were the times set up during a delivery flight to Khartoum, shortly after completion of B.E.A. acceptance trials on August 10th. Khartoum was reached from Hurn in 12 hours' flying time at an average speed of 260 m.p.h. On the first stage—from Hurn to Rome—the block-to-block time was 3hr 51min, an average of 246 m.p.h. for the 930-mile trip. Cruising at 20,000ft the Ambassador recorded a true air speed of between 240 and 250 m.p.h. Fuel consumption was 588 gallons. The second machine for B.E.A. will be demonstrated at Farnborough next week before delivery to the Corporation. A design study has been prepared for a development of the Ambassador powered with four Rolls-Royce Dart R.Da3 turboprops. This would have slotted flaps and additional centre-section tanks—already provided for in the design and increasing the total capacity to 1,600 gall.

Armstrong Whitworth Apollo

THROUGHOUT the year development of the first prototype of the Apollo was going ahead, though at a somewhat slackened pace due to the makers' preoccupation with the defence programme. An excellent impression was made during a demonstration flight in France. It is possible that the second Apollo will be powered with the new Mamba ASM.3 turboprops. With these units the maximum take-off weight would be 45,000lb and the maximum landing weight 43,000lb. Estimated figures are: fuel consumption at max. continuous power at 25,000ft, 235 gall/hr (speed 310 m.p.h.); fuel consumption at economical cruising speed (276 m.p.h.), 203 gall/hr; still-air range, 1,350 miles; ceiling, 30,000ft; rate of climb at sea level on three engines, 1,350ft/min. Seating capacity is 26-31 and baggage space 330 cu ft.

Auster Types

TO meet various civil requirements the following types are offered by Auster Aircraft, Ltd.: Autocrat (a Cirrus Minor-engined three-seater, already well known in many countries); Autocar (a four-seater with Gipsy Major I engine, redesigned tail, and deeper rear fuselage); Aiglet (a three/four-seater with the large tail and reconditioned Gipsy Major engine); and Aiglet Trainer, differing from the standard Aiglet in having wings of shorter span and simplified wing-bracing. Certain Autocars have been delivered as light freighters. In this version the rear part of the cabin roof is made readily detachable allowing bulky loads to be shipped.

Auster Autocar.

Auster Aiglet.

Auster Autocrat.

Auster Aiglet Trainer

Avro Canada Jetliner

DEVELOPMENT of this Canadian-designed and built pure-jet airliner (four Rolls-Royce Derwent turbojets) for civil purposes has been temporarily suspended, though interest has been displayed in its potentialities as a military trainer.

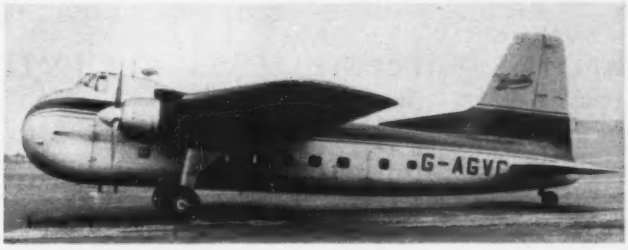
Avro Canada Jetliner.

Blackburn and General Aircraft Universal Freighter

A Mk 2 version of the Universal Freighter (civil counterpart of the G.A.L.60) has recently been announced. This will be fitted with four Bristol Centaurus 171 engines in place of the Hercules 761s, and will have a redesigned tail and new loading doors. The increased power will allow a payload of 19½ tons on short hauls.

Bristol 170, Mk 31

WITH Bristol Hercules 739 engines, the Mk 31 development of the Bristol 170 Freighter flies at a gross weight of 42,000 lb. Externally it differs from its predecessors in having a dorsal fin. It may be employed on short or medium hauls, carrying a freight load of up to 11,000 lb.



Bristol 175

THE Type 175 was designed primarily for service on long- and medium-range routes operated by B.O.A.C. The cabin is pressurized for operation at 35,000ft and the maximum payload is 23,500 lb. Mr. Whitney Straight, deputy chairman of the Corporation, has said that this machine will be the cheapest airliner in the world to operate. In its 46-seat version it will have more room and afford better comfort than any other airliner flying. A layout to seat over 100 is possible.

Bristol 175.

Bristol Brabazon

FAVOURABLE impressions have been formed by passengers fortunate enough to fly in the piston-engined Brabazon I during the year. Work is well advanced on the Mk II version, powered with Bristol Proteus turboprops, and this should show a very much improved performance, the estimated cruising speed being 350 m.p.h. at 35,000ft. Various structural alterations have been made and provisional gross weight is given as 300,000 lb.

Bristol Brabazon I.

de Havilland Comet

British Aircraft, 1951 — CIVIL . . .

Chrislea Types

PRODUCTION of the Super Ace and Skyjeep light aircraft has been suspended by the Chrislea Aircraft Co., Ltd., to permit concentration on important sub-contracts arising from the expansion of the Royal Air Force. It may be recalled that the 4-seat Skyjeep is in many respects similar to the nosewheel Super Ace, but has a tail-down undercarriage. The top fuselage coaming is removable to allow freight loading.

de Havilland Comet

IT is not yet permissible to state the full extent of the orders for, and interest in, the de Havilland Comet—the world's premier example of the pure-jet airliner for arterial routes. It can be said, however, that 14 are on order for B.O.A.C., two for Canadian Pacific, two for the Union Aeromaritime de Transport, and two for the Ministry of Supply, and that Panair do Brasil has signified its intention of acquiring three. The standard Comet, Series I, flies at a weight of 105,000 lb and is powered with four D.H. Ghost 50 engines, giving a cruising speed of 490 m.p.h. at an altitude of 35,000ft or higher. The still-air range is over 3,000 miles and—excellent as this is, particularly as the Comet was the world's first pure-jet airliner—it will be surpassed by the Series II version, announced during the year. This will be powered with axial Rolls-Royce Avons.

de Havilland Beaver and King Beaver

OVER 150 Beavers are already in service in Canada and the type is in production for the U.S. Army. A new, larger development—the King Beaver—will carry 8-14 passengers. The prototype should fly this year.

de Havilland Drover

UNUSUAL in being powered with three Gipsy Majors, this Australian 6/7-passenger monoplane cruises at 135 m.p.h. Variable-pitch airscrews are fitted but the undercarriage is non-retractable.

de Havilland Dove

INTEREST in this remarkably efficient light, twin-engined transport has not only been maintained during the past year, but, in America at least, has received a decided fillip. This is understandable when it is realized that an executive Dove, for example, offers a still air range of 1,153 miles at 165 m.p.h. at 8,000ft, carrying a load of 1,185 lb. The engines are supercharged Gipsy Queen 70 Mk 2s.

de Havilland Dove.

de Havilland Heron

AMERICA, which has already taken the Dove to its heart, is now, in common with other countries, displaying real interest in the four-engined Heron, which has rightly been likened to a scaled-up, four-engined Dove. Several Herons, some with retractable undercarriage, others with fixed gear, should fly this year. Flying impressions (*Flight*, August 3rd, 1951) are distinctly favourable, even with one engine inoperative.

de Havilland Heron.

Chrislea Skyjeep.

de Havilland Beaver.

Handley Page Hermes V.

Handley Page Hermes IV.

Miles Aries

THE Aries is especially welcome to the ranks of British civil aircraft in that it is virtually a new type of fast 4-seater tourer. Externally it bears a very strong resemblance to the Gemini, from which it was developed, but has more powerful (150 h.p. Cirrus Major) engines, increased luggage capacity in a locker behind the cabin, and taller fins and rudders. The rate of climb, even at the designed all-up weight of 3,475 lb, is quite exceptionally good. Single-engined performance (with standard fixed-pitch wooden airscrews) is also good.

Miles Aries.

Handley Page Hermes IV

A FLEET of Hermes IVs is now well established in the service of British Overseas Airways. As supplied to that Corporation the type accommodates 40 passengers, the remarkably spacious fuselage being divided into two cabins, each seating 20. For relatively short-haul work a maximum of 74 passengers can be accommodated, but B.O.A.C. were seeking—and have secured—an exceptionally high standard of comfort.

Handley Page Hermes V

THIS fast and comfortable turboprop airliner (four Bristol Theseus) beat the London-Paris "record" for an aircraft of its class by crossing from London Airport to Paris (Orly) last June in 46 minutes from take-off to landing circuit. As remarked on that occasion, the big question mark in Hermes V planning concerns the power plant. Although the Theseus is installed at present, a new mark of Proteus has been considered as a possibility.

Handley Page (Reading) Marathon

A NOTABLE landmark in Marathon development was a series of take-off and landing tests at Woodley last October, in the presence of technicians of British European Airways, to determine with what margin the aircraft could operate from the smallest airfields. B.E.A. said these tests were "quite satisfactory." On previous overseas demonstrations the Marathon had acquitted itself admirably under very trying circumstances.

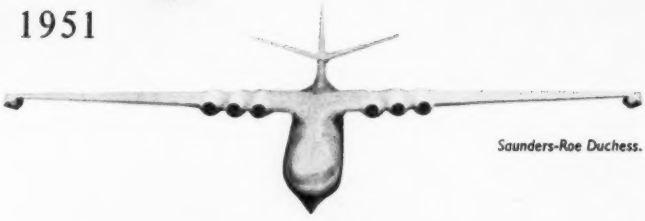
Percival Prince

THE civil version of this remarkably versatile twin-engined high-wing monoplane is now in production as the Series III Prince and incorporates various improvements as a result of experience gained with the Series I and II. The most noticeable innovation is the up-grading of engine power from 520 to 550 h.p. for take-off. Survey and ambulance versions, and other variants equipped for freight-carrying and pest control, are offered.

Percival Prince (survey version).

Saunders-Roe Princess

British Aircraft, 1951



Saunders-Roe Duchess.

—CIVIL...

Saunders-Roe Princess

ALTHOUGH the three specimens now under construction at Cowes will be utilized for military purposes, the Princess is the pre-eminent example of the large long-range flying-boat designed for civil transport. As the designer emphasized in a lecture this year, such an aircraft need not suffer from preconceived disadvantages such as high drag and weight; this is borne out by the estimated cruising speed of 380 m.p.h. at 37,000ft.

Saunders-Roe Duchess

THIS projected pure-jet, medium-range flying-boat is designed to have a direct operating cost (1d a mile for 1,300-mile stages) lower than that of any other medium-range airliner in the world. With six D.H. Ghost turbojets the gross weight would be about 130,000 lb. Payloads of the order of 21,000 lb would be carried on stage-lengths of 1,300-2,000 miles, at cruising speeds up to 500 m.p.h.

Scottish Aviation Pioneer

THE Mk II (Leonides-powered) version of the Pioneer is a light transport with a maximum cruising speed of 151 m.p.h. The take-off run to 50ft (I.C.A.N. conditions) is 230 yd. Floats or skis are offered.

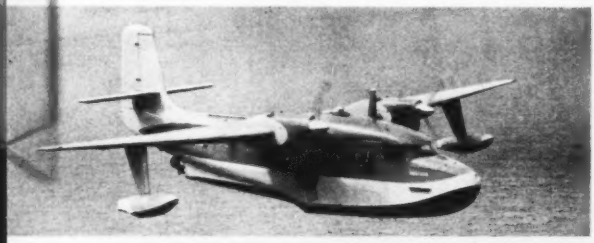
Short Sealand

THE capabilities of the Sealand amphibian (two D.H. Gipsy Queen 70-3s) in respect of operating economy and versatility are already generally known. During the past year a representative of *Flight* had the opportunity of flying a Sealand and reported that it was literally viceless, possessed of adequate stability in all planes and, if properly handled, fully as gentle as the proverbial Anson. Under I.C.A.N. conditions the take-off run to 50ft (I.C.A.O. procedure) is 1,030 yd; on landing the Sealand loses speed quickly and pulls up in a surprisingly short distance. Overseas demonstration tours have stimulated an already wide interest.

Vickers-Armstrongs Viscount

FIRM orders for Viscounts of the 700 series have already been placed by three airlines—B.E.A., Air France and Aer Lingus. The excellence of the performance conferred by four Rolls-Royce Dart RDa3 turboprops will be apparent from the data table on page 339, especially notable being the maximum cruising speed of 340 m.p.h. at 25,000ft. With a crew of two the payload is 12,740 lb. The initial rate of climb on full power is 1,540ft/min, dropping to 940ft/min with one Dart out of action. The take-off run to 50ft is 1,350 yd. Variants immediately foreseen in the 700 series are the 701, a 40-seater with a crew of three; the 702A, with the same passenger accommodation but with a crew of only two and additional freight space; and the 703, a 53-seater with a crew of three, for high-density traffic. An initial overhaul period of 500 hr for power plants and airscrews is expected, absence of vibration, of course, being largely responsible for high serviceability.

Short Sealand.



Scottish Aviation Pioneer Mk 2.

Vickers-Armstrongs Viscount 700.

British Aircraft, 1951

Bristol 171 Mk 3 (Sycamore).

ROTARY-WING TYPES

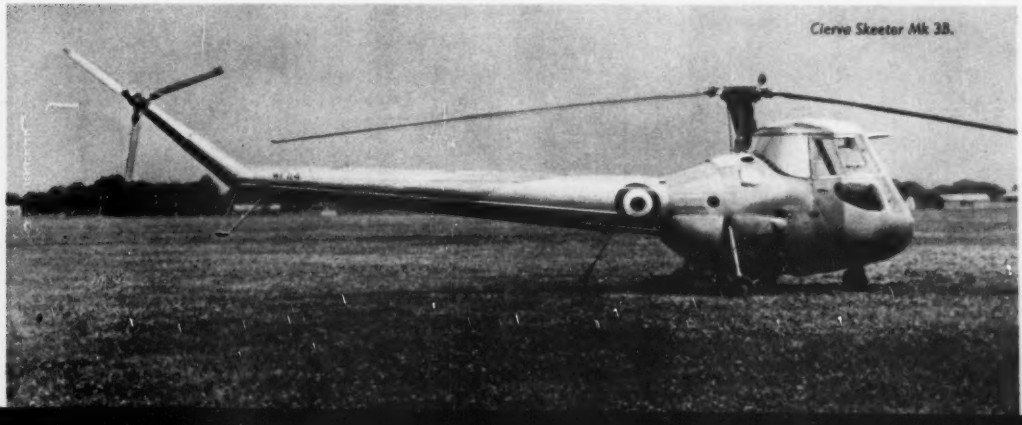
Bristol 171 Mk 3 (Sycamore)

HIGHLY encouraging results have been achieved with this single-engined helicopter in its varied civil and military applications. Duties include taxi work, reconnaissance and observation, patrol and air/sea rescue. The type is a 4/5-seater, powered with an Alvis Leonides engine, mounted with crankshaft vertical in the fuselage centre-section. The cabin seats two, side-by-side with dual controls, and two or three on the bench-type rear seat. The present form of cabin results in a somewhat blunter nose than in earlier models and affords an exceptional wide field of view in essential directions. Due in part to its exceptionally clean aerodynamic design, the 171 Mk 3 is capable of flying at 120 m.p.h. at 5,000ft. Empty and loaded weights are, respectively, 3,537 and 5,200 lb, and the service ceiling is 19,000ft. Cruising at 83 m.p.h., a range of 330 miles is attainable at sea-level. During June this year an R.A.F. Sycamore (this name has been adopted by the British Services) was flown out to Khartoum in a Bristol 170 Freighter for tropical trials, which were expected to last from two to three months. Meantime, production of civil and military variants is well under way (photograph page 277).

Bristol 173.

Bristol 173

THIS large twin-rotor helicopter was very fully described in *Flight* of March 16th, 1951. Two Alvis Leonides engines have been standardized and each rotor is nominally driven by its own engine, the forward unit rotating anti-clockwise in plan, the rear unit rotating clockwise. In the event of an engine failure, however, both rotors would be driven by the remaining engine. Autorotation descents are possible, and it may be remarked in this connection that the high inertia of the rotor systems would give the pilot the relatively lengthy action period of 4 sec. The first prototype (now complete) will be used chiefly to prove the configuration; the second, however, should be fully representative of the production type, and it is intended that the first example to go into operation will be used by B.E.A. for operational investigation of Orkney-Shetland and similar routes. Service roles would be the carriage of 18 airborne troops; ambulance flying with 10 stretcher cases or 10 sitting cases, or combinations of each; air/sea rescue, freight carriage; radar calibration; photographic work; signal-line laying; air observation; and—an increasingly important task—employment as a mobile crane. The designed all-up weight is 10,600 lb. In the suggested B.E.A. version 10 seats would be pitched in pairs abreast. The cabin length is 26ft 2in and the maximum width 5ft 3in.



Cierva Skeeter Mk 3B.

Cierva Air Horse.

Cierva Skeeter

WHEN development of Cierva helicopters was taken over early this year by Saunders-Roe, Ltd., it was required that the Skeeter should be prepared as soon as possible for flight evaluation by the Airborne Forces Experimental Establishment, the Army and the Navy. Three Skeeters, all appreciably different, have been built to date, two—designated Mk 3—with Gipsy Major engine, and the third—the Mk 4—with a Blackburn Bombardier. This third type, performance figures of which are withheld, was designed to meet naval needs. It holds high promise as a trainer and general-purpose type not only for Service, but for civil use.

British Aircraft, 1951—ROTARY-WING TYPES

Cierva Air Horse

FOLLOWING an accident to the original Air Horse, due to a fatigue failure in a detail fitting, the second aircraft has been completely stripped, inspected and re-assembled, and preliminary engine runs have been made. Instrumentation to a programme agreed with the Ministry of Supply is being installed, and it is expected that ground-running and some flying will take place later this year. Empty and loaded weights of the Air Horse, with Rolls-Royce Merlin 24 engine, are 12,140 and 17,500 lb. Up to 24 passengers could be accommodated in addition to a crew of two.

Westland-Sikorsky S-51

TO the credit of the S-51 goes a considerable amount of pioneer passenger-flying with B.E.A. and highly successful crop-spraying with Pest Control, Ltd. Under the designation Dragonfly H.R.1 the type has been adopted by the British Armed Services for a variety of military duties. All production models are powered with the Alvis Leonides engine and fly at a gross weight of 5,870 lb, the maximum disposable load being 1,440 lb. The cubic capacity for payload is about 92 cu ft, and, in addition to the pilot, three passengers can be seated. Still-air range at 85 m.p.h. is 200 miles.

Westland-Sikorsky S-55

THOUGH the first models of the S-55 are powered with the American Pratt and Whitney Wasp engine, the possibility of redesigning for a British power unit is under active consideration. The empty weight is 4,395 lb and the gross weight 6,800 lb. Although the overall dimensions are by no means large (rotor diameter 53 ft), the cubic capacity for payload is remarkably high at 340 cu ft, and eight or ten passengers can be carried in addition to the two pilots. The maximum cruising speed is given as 86 m.p.h. at 1,000 ft. A valuable feature is the complete accessibility of the nose-mounted engine.

Westland-Sikorsky S-51 (Dragonfly).

Westland-Sikorsky S-55.

DE HAVILLAND ENTERPRISE

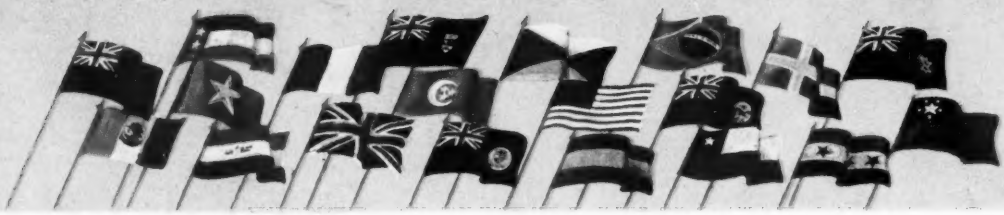
S.B.A.C. Display, Farnborough, England, 1951

B·O·A·C

COMET. The first jet mainliner—eight miles a minute, eight miles high.

BEA

AMBASSADOR. The "Elizabethan" class continental airliner of British European Airways.



Some countries in which de Havilland light transports operate daily.

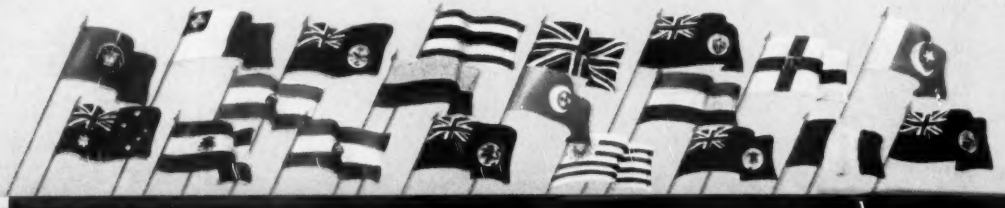
HERON. The simple and economical 14/17-passenger four-engined feeder liner.

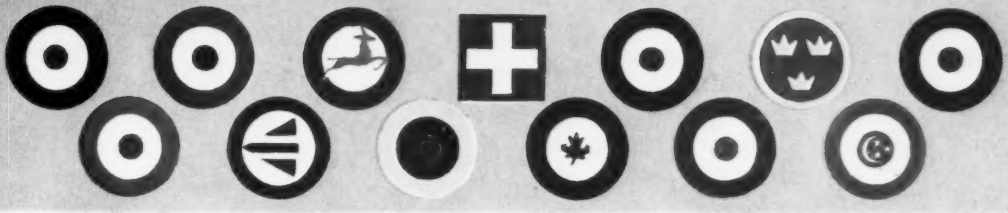
DOVE. The eight- or eleven-passenger airliner in miniature.

BEAVER. The Canadian half-ton bush transport.

DROVER. The Gipsy-powered Australian utility transport.

Some countries in which de Havilland light transports operate daily.





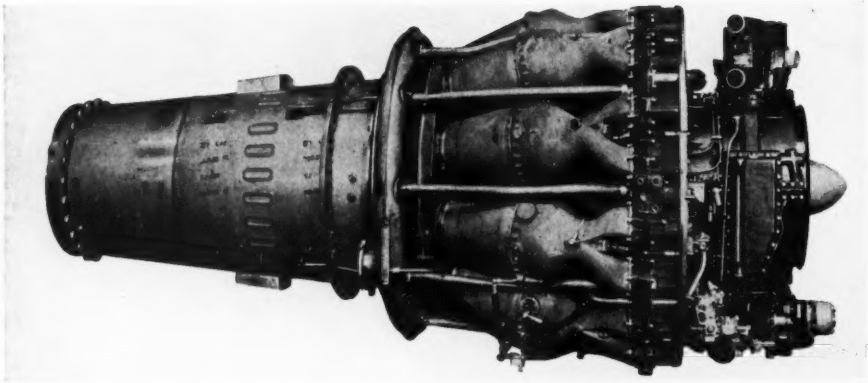
Countries which have selected de Havilland fighters.

VENOM. The Ghost-powered high-altitude fighter—in full production in day, night, and naval versions.

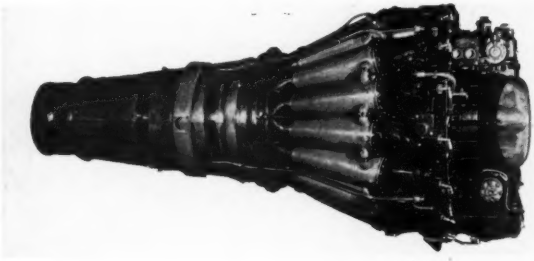
VAMPIRE 5. The basic aeroplane of the range of versatile fighters.

CHIPMUNK. The de Havilland elementary trainer—serving to-day in seventeen countries.

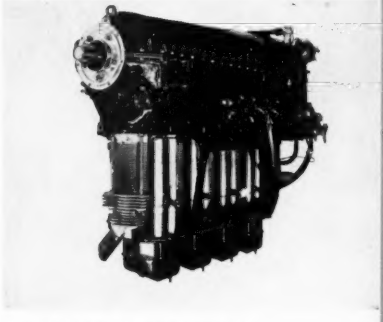
Countries in which de Havilland engines are in military service.



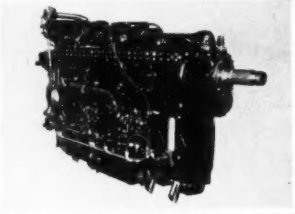
The Ghost turbine—built in six production plants for widespread military and civil use.



Goblin 35—the current production version of the world's most widely adopted turbine.

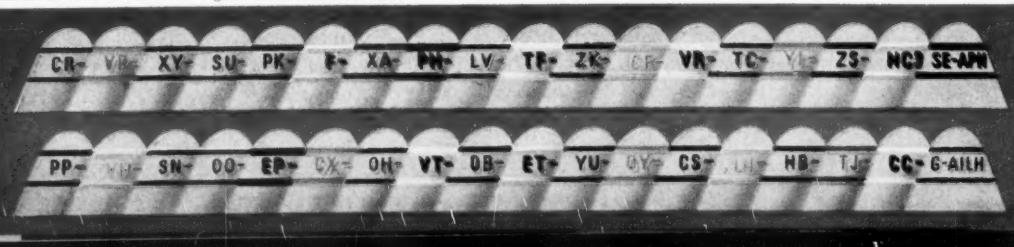


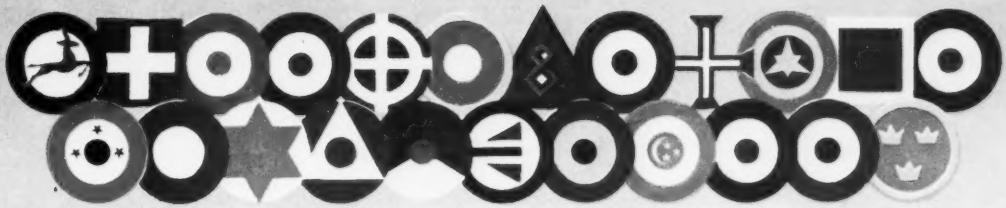
The 250-h.p. Gipsy Queen 30, representing the range of six-cylinder engines.



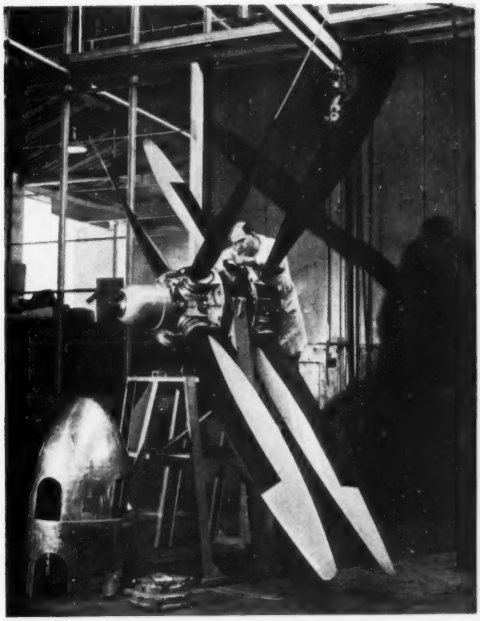
The famous 145-h.p. Gipsy Major follows a unique tradition of reliability.

Countries in which de Havilland engines are in civilian service.



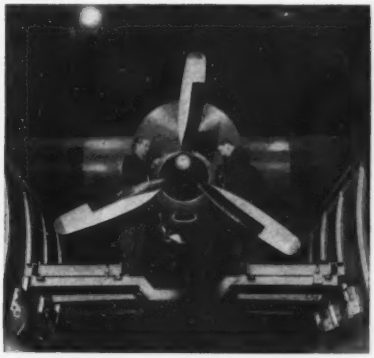


Countries in which de Havilland propellers are in military service.



A counter-rotating turbine propeller for the Saunders-Roe Princess which absorbs 6,700 shaft horse-power.

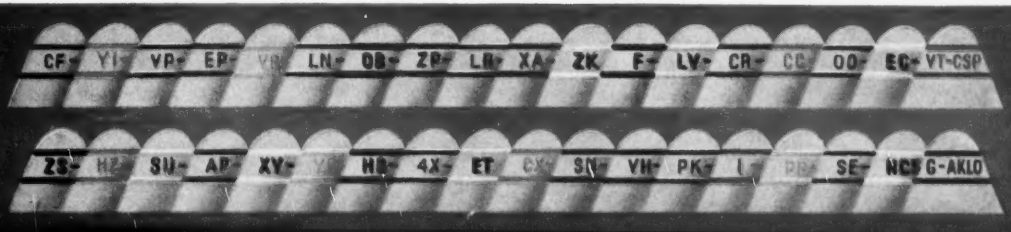
A small turbine propeller being prepared for test in one of the de Havilland tunnels.



A light-weight turbine propeller of exceptional aerodynamic efficiency.

The smallest de Havilland controllable-pitch propeller —manually controlled, for powers of 90 to 200 h.p.

Countries in which de Havilland propellers are in civilian service.



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WORLD SERVICE
Manufacturing Establishments
England
Australia
Canada
New Zealand
Area Management Offices
Cairo
Johannesburg
Montevideo
New York
Salisbury
Stockholm
National Agencies
Athens
Bangalore
Bangkok
Bogota
Brussels
Buenos Aires
Caracas
Casablanca
Ciudad Trujillo
Copenhagen
Geneva
Georgetown
Guatemala City
Havana
Istanbul
La Paz
Leopoldville
Lima
Lisbon
Madrid
Mexico City
Michigan
Milan
Montevideo
Oslo
Paris
Rio de Janeiro
Santiago
Mobile Field Service Engineers
A recent disposition
Arizona
Baghdad
Bangkok
Beirut
Cairo
Cape Province
Caracas
Delhi
France
Haifa
Khartoum
Lagos
Lisbon
Louisiana
Lucerne
Melbourne
Milan
Montreal
Nairobi
New Plymouth
Ohio
Port Moresby
Port Said
Rome
San Diego
Singapore
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The achievements of Britain's civil, military and research aircraft are the result of skill, not only in design and construction, but also in the production of raw materials. The Nimonic Series of Alloys, for instance, plays a vital part in components to resist stress at extremely high temperatures. One or other of the Nimonic Alloys is used for rotor blades in every British aircraft gas turbine in production.

HENRY WIGGIN & COMPANY LTD · WIGGIN ST · BIRMINGHAM 16

BRITISH AIRCRAFT TO SCALE

WITH the dual object of affording a comparison of size and plan-form and of stimulating interest in the useful art of aircraft recognition, these *Flight* scale drawings (1 in = 40ft) have been prepared. Each is captioned with the name of the aircraft and power plant, followed by the span (over tip-tanks, if shown), and—where available—gross weight ("n.a." = "not available"). It should be explained that the name of a Service aircraft is followed by a letter, or combination of letters, signifying duty, and by a mark number. Thus, "Vampire F.B.5" means that this variant is a fighter-bomber, Mark 5. The symbols N.F. = night fighter; P.R. = photographic reconnaissance; F.R. = fighter reconnaissance; M.R. = maritime reconnaissance; A.O.P. = air observation post; A.S. = anti-submarine; T. = trainer; T.F. = torpedo fighter; C. = communications and transport.

Fighter, Fighter/Bomber and Fighter/Reconnaissance Types

Drawings by BARRY JONES

D.H. VAMPIRE N.F.10
D.H. Goblin 3
38ft 0in Weight n.a.

D.H. VAMPIRE F.B.5
D.H. Goblin 2
38ft 0in 12,360 lb

D.H. VENOM F.B.1
D.H. Ghost
41ft 9in Weight n.a.

D.H. VENOM N.F.2
D.H. Ghost
41ft 9in Weight n.a.

D.H. SEA VENOM N.F.20
D.H. Ghost
41ft 9in Weight n.a.

D.H. SEA HORNET N.F.21
R-R. Merlin 130/131s
45ft 0in 19,460 lb

D.H. SEA HORNET F.R.20
R-R. Merlin 130/131s
45ft 0in 18,530 lb

GLOSTER METEOR F.8
R-R. Derwent 8s
37ft 2in 15,675 lb

GLOSTER METEOR P.V.
R.-R. Derwent 8s
41ft 0in 16,200 lb

GLOSTER METEOR F.R.9
R-R. Derwent 8s
37ft 2in 15,770 lb

A.W. (GLOSTER) METEOR N.F.11
R-R. Derwents
43ft 0in Weight n.a.

HAWKER SEA FURY F.B.11
Bristol Centaurus 18
38ft 5in 12,350 lb

HAWKER SEA HAWK F.1
R-R. Nene
39ft 0in Weight n.a.

VICKERS-SUPERMARINE 535
R-R. Nene or Avon
31ft 8½in Weight n.a.

VICKERS-SUPERMARINE ATTACKER F.1
R-R. Nene 3
36ft 11in 11,750 lb

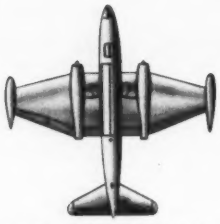
HAWKER P.1081
R-R. Nene
31ft 6in Weight n.a.

SAUNDERS-ROE S.R./A.1
Metrovick Beryls
46ft 0in 16,255 lb

AVRO CANADA CF-100
Avro Canada Orendas
55ft 0in Weight n.a.

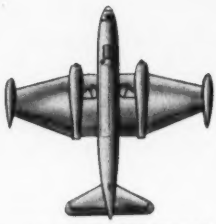
FLIGHT COPYRIGHT

For Bombing, Strike, Reconnaissance and Research



ENGLISH ELECTRIC CANBERRA B.2
R-R. Avons
65ft 0in Weight n.a.

BRISTOL BRIGAND B.1
Bristal Centaurus 57
72ft. 4in 39,000lb



ENGLISH ELECTRIC CANBERRA P.R.3
R-R. Avons
65ft 0in Weight n.a.

SHORT S.B.3
A.S. Mambas
59ft 11in Weight n.a.

GLOSTER METEOR P.R.10
R-R. Derwent 8s
43ft 0in 15,400 lb

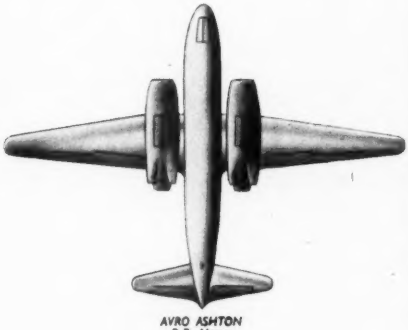
BLACKBURN AND GENERAL AIRCRAFT Y.B.1
A.S. Double Mamba
51ft 2in Weight n.a.

FAIREY FIREFLY A.S.7
R-R. Griffon
44ft 6in Weight n.a.

WESTLAND WYVERN T.F.2
A.S. Python
44ft 0in Weight n.a

FAIREY GANNET
A.S. Double Mamba
54ft 4in Weight n.a.

AVRO SHACKLETON M.R.1
R-R. Griffons
120ft 0in Weight n.a.



AVRO ASHTON
R-R. Nenes
120ft 0in 82,000 lb

ARMSTRONG WHITWORTH A.W.52
R-R. Nenes
90ft 0in 34,154 lb

AVRO 707A
R-R. Derwent
34ft 2in Weight n.a.

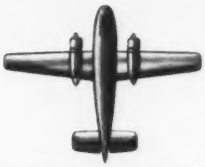
FAIREY F.D.1
R-R. Derwent
19ft 6in Weight n.a.

VICKERS-ARMSTRONGS TAY-VISCOUNT
R-R. Tays
89ft 0in Weight n.a.

AVRO 707B
R-R. Derwent
33ft 0in Weight n.a.

BOULTON PAUL P.111
R-R. Nene
33ft 6in Weight n.a.

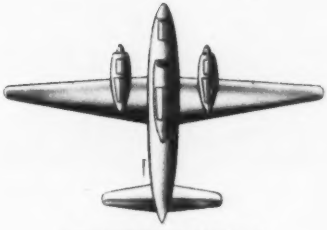
BOULTON PAUL P.119
R-R. Derwent
38ft 9in 9,650 lb



PERCIVAL PRINCE AND SEA PRINCE
Alvis Leonides 502s
56ft 0ins 11,500lb

D.H. CHIPMUNK T.10
D.H. Gipsy Major 10
34ft 4in 2,000 lb

D.H. VAMPIRE TRAINER
D.H. Goblin 3
38ft 0in 11,030 lb



VICKERS-ARMSTRONGS VARSITY T.1
Bristol Hercules 264s
95ft 8in 37,500 lb

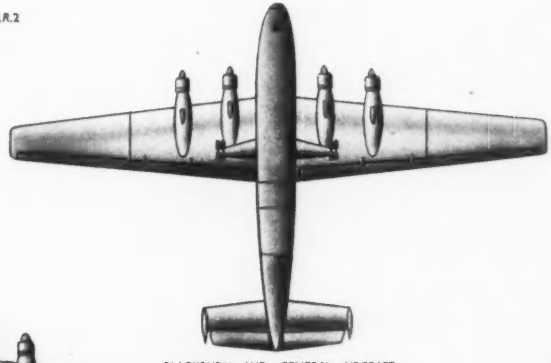
GLOSTER METEOR T.7
R-R. Derwent 8s
37ft 2in 14,000 lb

BOULTON PAUL BALLIOL T.2
R-R. Merlin 35
39ft 4in 8,410 lb

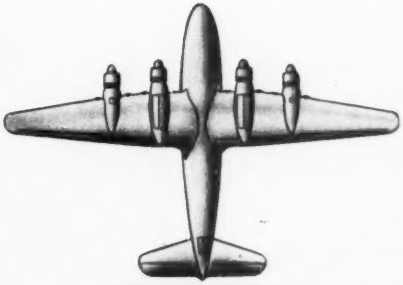
FAIREY FIREFLY T.1
R-R. Griffon 2 or 12
44ft 6in 12,300 lb

HANDLEY PAGE (READING) H.P.R.2
Alvis Leonides 502/4
37ft 0in 4,400 lb

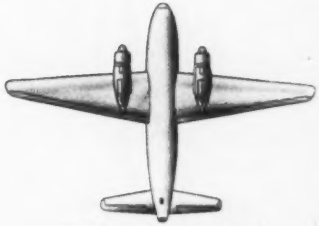
PERCIVAL PROVOST T.1
Alvis Leonides 25
35ft 2in 4,250lb



BLACKBURN AND GENERAL AIRCRAFT
G.A.L.60
Bristol Hercules
162ft 0in Weight n.a.



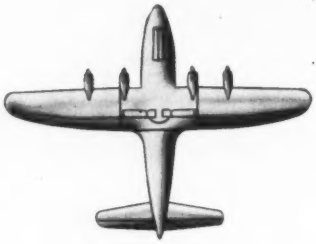
HANDLEY PAGE HASTINGS C.1
Bristol Hercules 101s
113ft 0in 75,000 lb
(Weight of C.2 and C.3 is 80,000 lb)



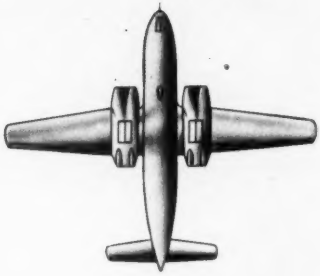
VICKERS-ARMSTRONGS VALETTA C.1
Bristol Hercules 230s
89ft 3in 36,500 lb

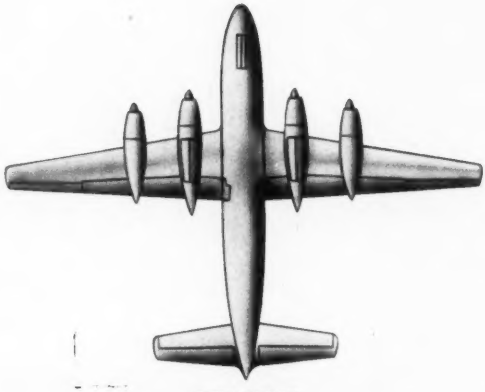
FLIGHT COPYRIGHT

ARMSTRONG WHITWORTH APOLLO
A.S. Mambas
92ft 0in 45,000 lb



AVRO CANADA JETLINER
R-R. Derwents
98ft 1in 60,000 lb





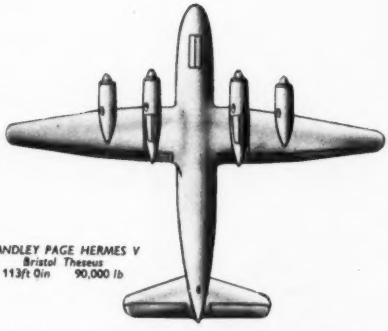
BRISTOL TYPE 175
Bristol Proteus
140ft 0in 130,000 lb

DE HAVILLAND COMET
D.H. Ghost 50s
115ft 0in 105,000 lb

SAUNDERS-ROE DUCHESS
D.H. Ghosts
135ft 6in 130,000 lb

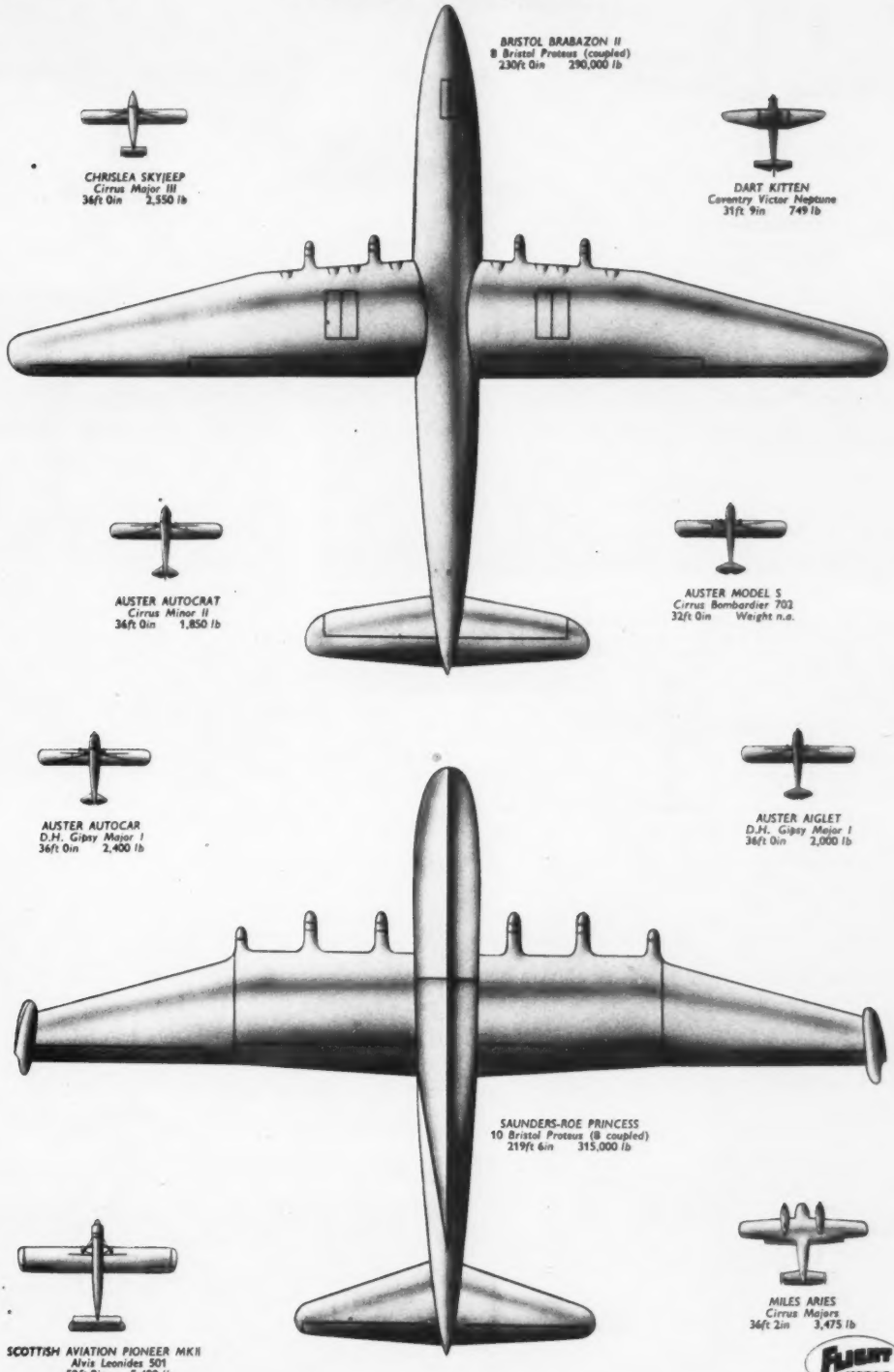
HANDLEY PAGE (READING) MARATHON II
A.S. Mambas
65ft 0in 18,000 lb

VICKERS-ARMSTRONGS VISCOUNT 700
R-R. Dart R.Da 3s
94ft 0in 52,500 lb

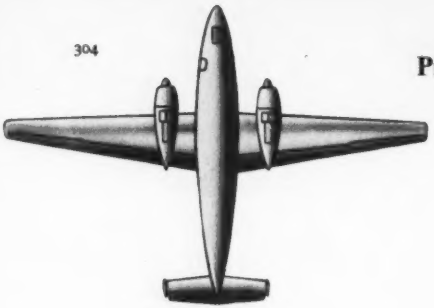


HANDLEY PAGE HERMES V
Bristol Theseus
113ft 0in 90,000 lb

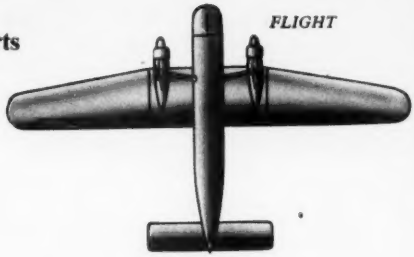
Super-Liners and Lightweights



Piston-Engined Transports and Helicopters



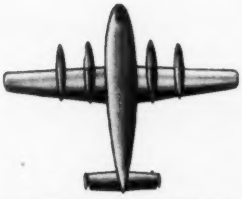
AIRSPEED AMBASSADOR
Bristol Centaurus 661s
115ft 0in 52,500 lb



BRISTOL 170 MK 31
Bristol Hercules 734s
108ft 0in 42,000 lb

HANDLEY PAGE HERMES IV
Bristol Hercules 763s
113ft 0in 86,300 lb

DE HAVILLAND HERON
D.H. Gipsy Queen 30 Mk2
71ft 0in 12,500 lb



HANDLEY PAGE (READING) MARATHON I
D.H. Gipsy Queen 70-3s or 70-4s
65ft 0in 18,000 lb

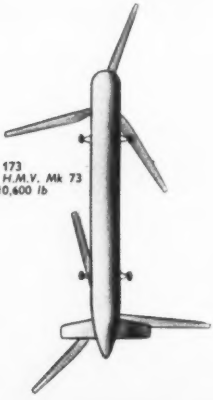
DE HAVILLAND DOVE
D.H. Gipsy Queen 70s
57ft 0in 8,500 lb

SHORT SEALAND MK 1
D.H. Gipsy Queen 70-3s
61ft 6in 9,100 lb

WESTLAND-SIKORSKY DRAGONFLY H.R.1 (S-51)
Alvis Leonides 521/1
48ft 0in 5,870 lb

BRISTOL 171 MK 3
Alvis Leonides Le23.H.M.
43ft 8½in 5,200 lb

WESTLAND-SIKORSKY S-55
Pratt and Whitney Wasp R-1340 S3H2
53ft 0in 6,800 lb



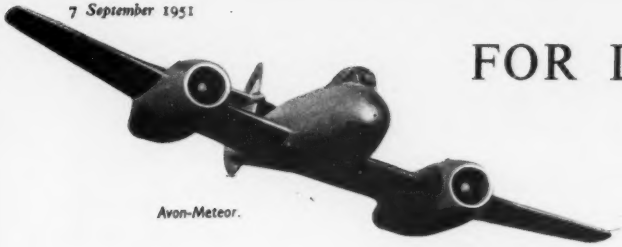
BRISTOL 173
Alvis Leonides Le23 H.M.V. Mk 73
48ft 7in 10,600 lb

CIERVA SKEETER MK 3
D.H. Gipsy Major
32ft 0in 2,000 lb

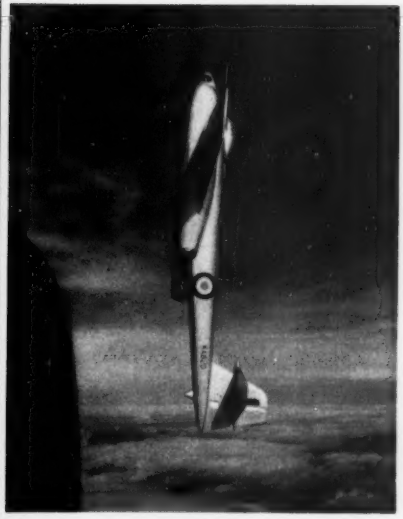
CIERVA AIR HORSE
Rolls-Royce Merlin 24
95ft 0in 17,500 lb

FLIGHT COPYRIGHT

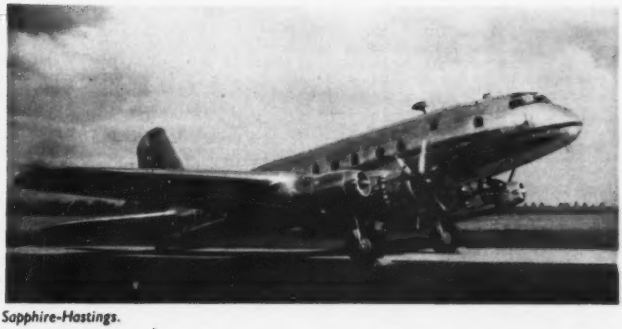
FOR DEVELOPMENT FLYING



Avon-Meteor.



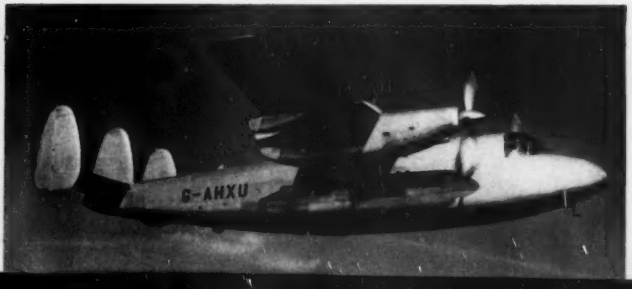
Sapphire-Meteor.

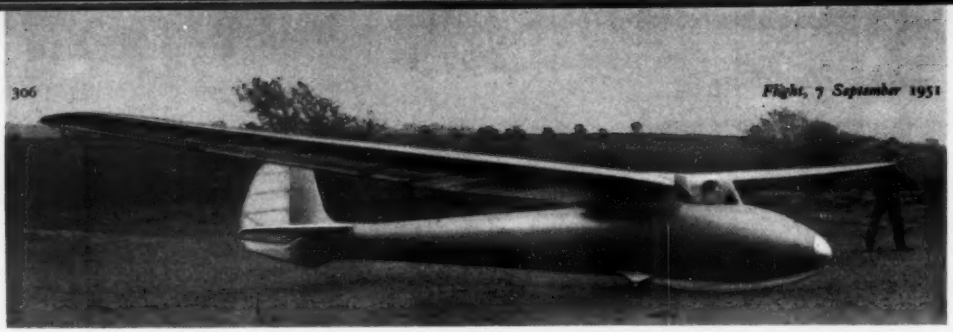


Sapphire-Hastings.

REALIZATION of Britain's vast programme of turbojet and turboprop development has necessitated the provision of numerous "flying test-beds" wherein the new power units and associated equipment may be developed and proved under conditions approaching those for which they were designed. It will be noted that the Avro Ashton and Vickers-Armstrongs Tay-Viscount are not represented on this page of typical engine-development aircraft. Those types, however, will be found on page 291 under the heading "Research"; and there they rightly belong, for, although valuable experience with the Nene and Tay respectively is being amassed with these machines, they are serving more in the nature of flying laboratories for the study of problems arising from high-altitude jet flight.

(Above) Proteus-Lincoln; (below) Mamba-Marathon (D.H. braking airscrews); (right) Python-Lancaster. N.B. Piston engines of the Lincoln and Lancaster are stopped.



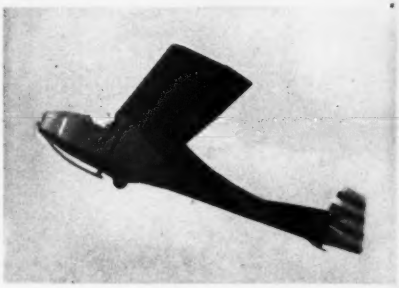


Slingsby Sky.

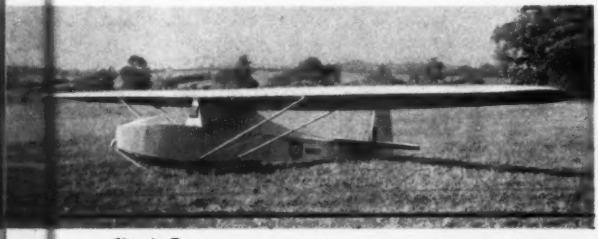
British Aircraft, 1951—SAILPLANES & GLIDERS—

A NOTABLE gliding innovation during the past year was the introduction of Slingsby's latest high-performance sailplane known as the Sky, or T.34, which figured successfully in a tussle for victory in the National Championship meeting recently. This beautiful craft, a specimen of which is honoured with a place in the South Bank Exhibition, is depicted here, together with the other products of Slingsby Sailplanes, Ltd. These include the Cadet and Tutor, which are, perhaps, the most widely used types manufactured by this Yorkshire company for training up to "C" Certificate standard. The Tutor, has a higher aspect ratio than the Cadet, and is suitable for hill soaring; the Prefect, equipped with instruments for cloud or cross-country flying, is semi-aerobatic; and the T-21B (Sedbergh) two-seater was designed to meet the requirements of a simple dual-control sailplane for club and Service use. It is known throughout the world for its docility and ruggedness.

The three designs offered by Elliotts of Newbury, Ltd., cover a wide range of gliding activities. The Primary Eon (Service name Eton), which is employed for *ab initio* training, has been found to be capable of withstanding an infinite number of heavy landings without undue concern. The orthodox Baby Eon is suitable for training prior to conversion to the high-performance types, such as the highly successful Olympia Eon.

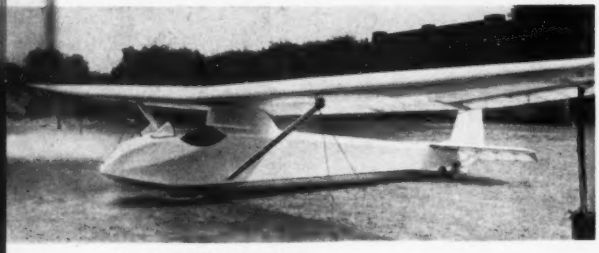


Slingsby Cadet



Slingsby Tutor.

Slingsby Prefect.

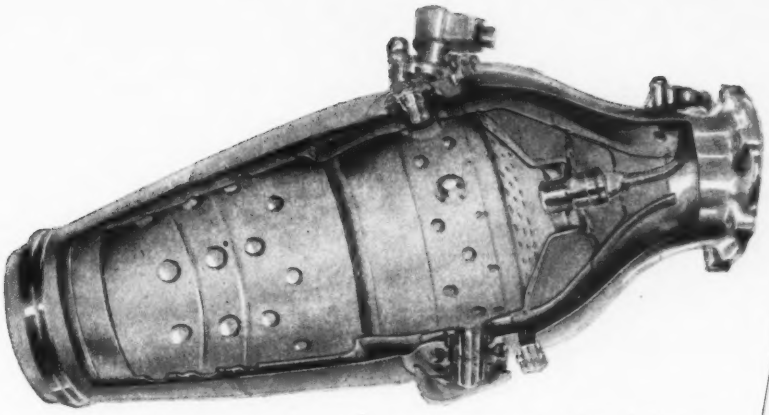


Slingsby T. 21b (Sedbergh).

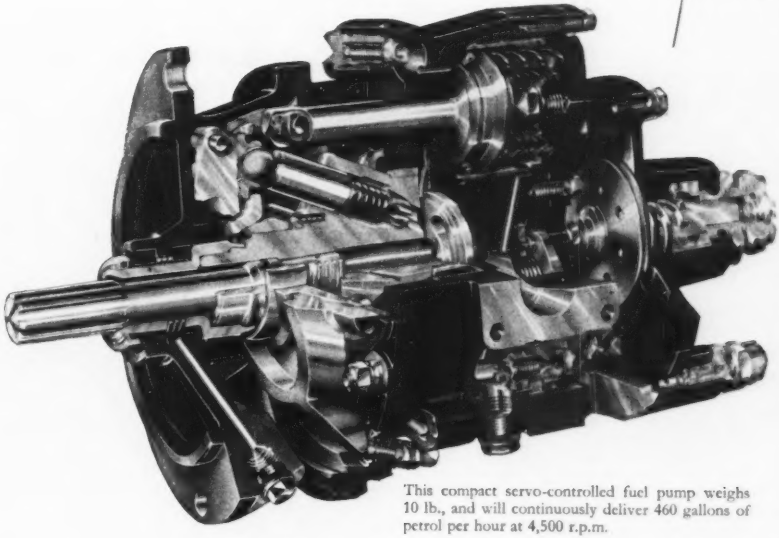
Primary Eon (Eton).

Baby Eon.

Olympia Eon.



The patent flow system of this Lucas Combustion Chamber gives high rates of heat release and even-temperature distribution at turbine.



This compact servo-controlled fuel pump weighs 10 lb., and will continuously deliver 460 gallons of petrol per hour at 4,500 r.p.m.

Visit LUCAS at Stand No. 133, *where we shall be pleased to discuss with you our latest developments in fuel and combustion systems for Gas Turbine Engines.*

LUCAS

JOSEPH LUCAS (GAS TURBINE EQUIPMENT) LTD. BIRMINGHAM & BURNLEY · ENGLAND

K

An Announcement . . .

DUREX ABRASIVES LTD wish to announce that as from June 14th, 1951, the name of the Company has been changed and is now the MINNESOTA MINING & MANUFACTURING COMPANY LTD.

Identification will be as before, except that the words "Scotch Boy" will be used instead of "Durex" as a prefix to the name of the material, e.g., "Scotch Boy Tapes" instead of "Durex Tapes".

Existing high standards in the quality of the products will be maintained, the change is in name only.

'SCOTCH BOY' *Masking* TAPE

"SCOTCH BOY" Masking Tape is supplied in rolls 72yds. long and in a variety of widths.

DISTRIBUTIVE ARRANGEMENTS UNCHANGED

Manufactured by

MINNESOTA MINING & MANUFACTURING COMPANY LIMITED

ARDEN ROAD · ADDERLEY PARK · BIRMINGHAM, 8

After 750 operations

Output remains . . .

64,000 ft. lb. in two seconds

No loss in performance, and negligible wear were recorded after 750 operations had been successfully completed by a standard Plessey TSC 50 Mk. 3 Turbine Starter.

With complete push button control from the cockpit, including automatic safeguards for engine and starter, the breech load of six cartridges is sufficient for three starts before reloading. The TSC 50 uses simple inexpensive cordite cartridges, has specially developed heat-resistant blades, over-speed safety protection, and an all-up weight of only 54.7 lbs. (25 kg.).

See it on Stand No. 113.

Write for full details

Plessey **TURBINE STARTER** **TYPE TSC 50 MK. 3**

PUMPS · VALVES · CARTRIDGE STARTERS · PRE-FORMED WIRING SYSTEMS · ELECTRIC ACTUATORS · RADIO COMMUNICATIONS

THE PLESSEY COMPANY LIMITED · ILFORD · ESSEX

ALVIS

ALVIS LEONIDES

No less than seven types of aircraft due at the S.B.A.C. Display are fitted with Alvis Leonides Engines

ALVIS LIMITED · COVENTRY · ENGLAND

COMET DECOR

Accommodation Scheme for the B.O.A.C. 36-Seater

BY general consent one of the most æsthetically satisfying aircraft ever built, the de Havilland Comet has a purity of line and a subtle perfection of form which, far from being ends in themselves, are simply the outcome of supremely well-designed fitness-for-purpose. The criterion of functionalism also applies to the interior scheme; but because there exists within the fairly wide ambit of suitable design a multitude of pitfalls for the unwary or inept in the choice of colours and textures, some exercise of taste and selectivity was imperative. It is, perhaps, quite enough to say that the interior of the Comet is a perfect complement to the beauty of the aircraft as a machine.

On entering the aircraft by the passenger door at the rear of the fuselage to port, one steps into a spacious vestibule or foyer floored in a dark-blue wool pile carpet. Immediately to one's left is a royal-blue-curtained wardrobe, with hat rack above; opposite, similarly curtained, is another, stowage volume for light luggage. Abaft this is a radio and "official stowage" compartment, the door of which is panelled in remarkably beautiful weathered sycamore veneer beneath a plastic surface.

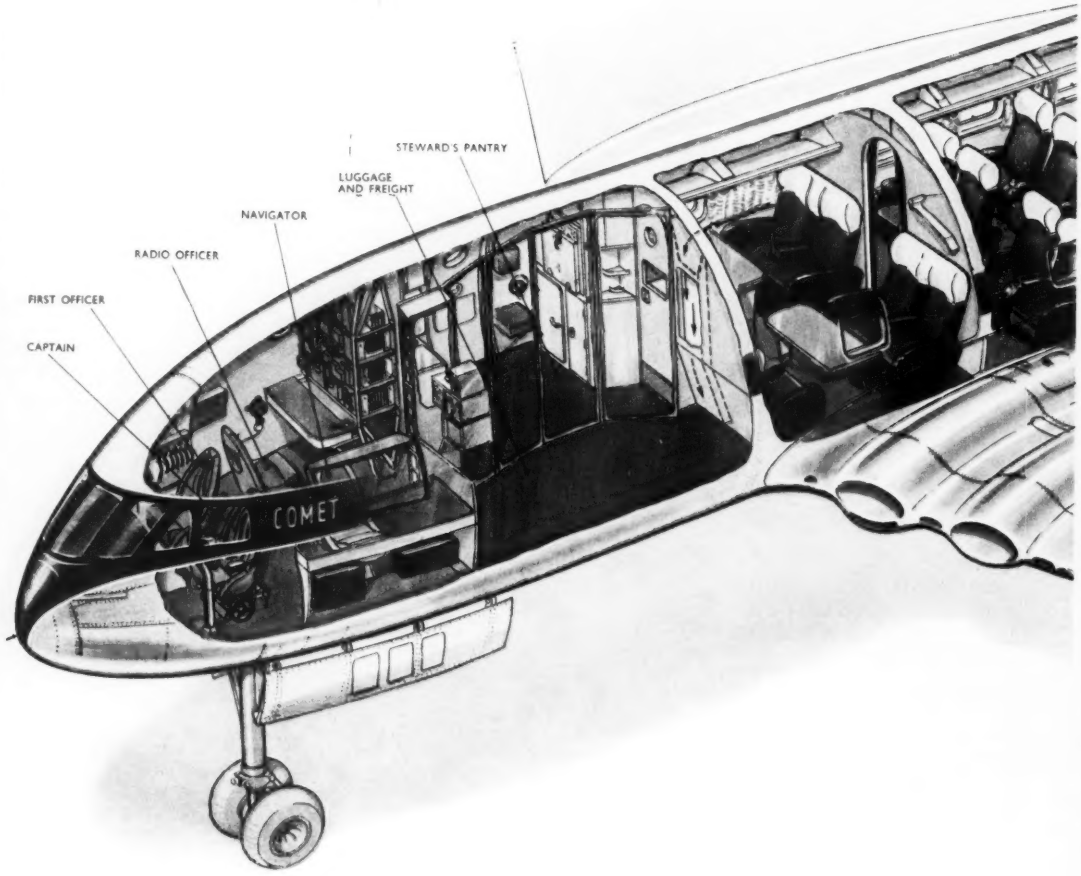
The after wall of the entry foyer is also panelled in plastic-finished sycamore. A central pier carrying a silver-anodized drum-type ash-canister with, above, the Corporation badge, is flanked by royal-blue curtained doorways giving into the ladies' (port) and gentlemen's (starboard) dressing rooms. Each of these compartments is essentially similar, although there are differences both in detail and in colour. The floor of the ladies' room is close-fitted with a deep-pile smoky-grey nylon carpet, which contrasts with the delicate pink of the furnishings and the grey of the leather-cloth walls and ceiling. Above the pink wash-basin, in a recess in the inboard wall, is a large mirror with a ring-tray flanked by box compartments for face tissues. Against the outboard wall, and facing aft, is a fixed seat for the fitted dressing-table, with its bottles of lotions and creams at the foot of a 20-in by 18-in mirror.

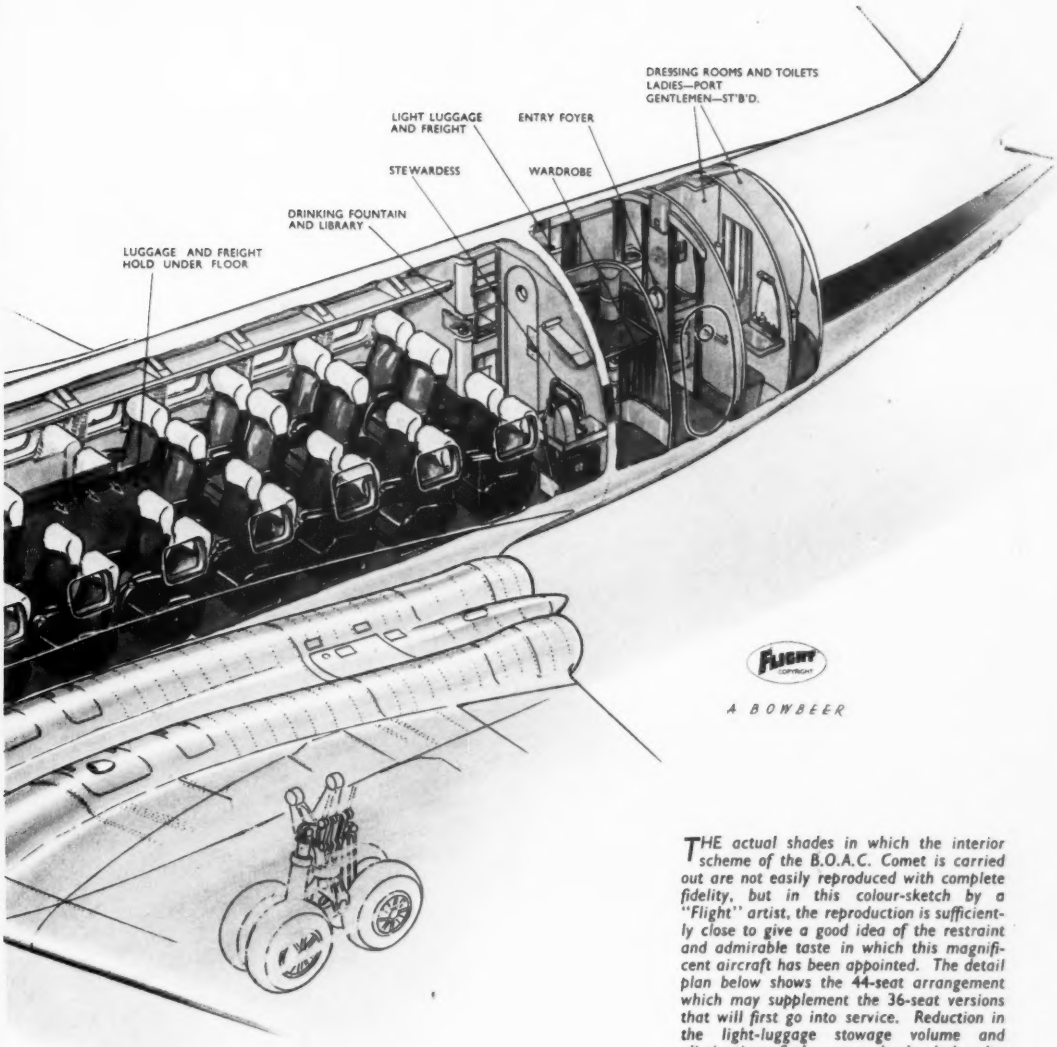
The male passenger in the Comet is, of course, not offered a boudoir; he is, however, provided with a

COMET DECOR . . .

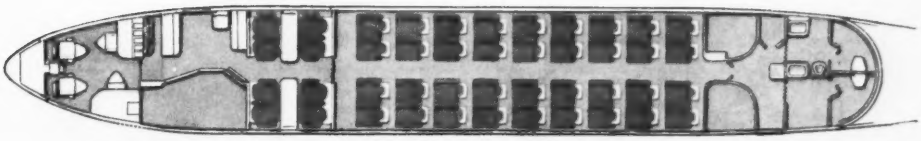
dressing room which strikes a nice balance between masculinity and the sybaritic. Walls and ceiling are covered in grey Vynide, the floor is laid with dark blue P.V.C. floor covering, and the wash-basin is in silver-anodized light alloy. Above the basin is a beige-grey moulded plastic fitting incorporating a tray and boxes for paper tissues, whilst beneath the basin are drawers and cabinets for clean and soiled towels. Rearward of the basin is a dressing table with receptacles for shaving lotion, talcum powder, and hair lotion; beneath the table is a recess, and below that a cupboard; these fittings, too, are in beige-grey plastic. A 14-in by 9-in mirror is bracket-hinged at an angle just inside the doorway, and another, slightly smaller, is fitted on the inboard wall above the toilet-funnel. At the rear of each dressing room is a separate compartment furnished with a self-flushing Vickers toilet.

Access to the main cabin is given from the entry foyer. Immediately on the left of the cabin door is a compact and well-equipped station for a steward or stewardess, while on the right are found a library and a built-in drinking fountain. A central aisle divides the seven rows of armchairs. These are B.O.A.C. "Overseas" Mk 4 units by Vickers and, upholstered in foam rubber, and covered in a herringbone-weave blue wool-faced tapestry, are indeed sumptuous receivers of the human body. At each (45-in pitch) seat

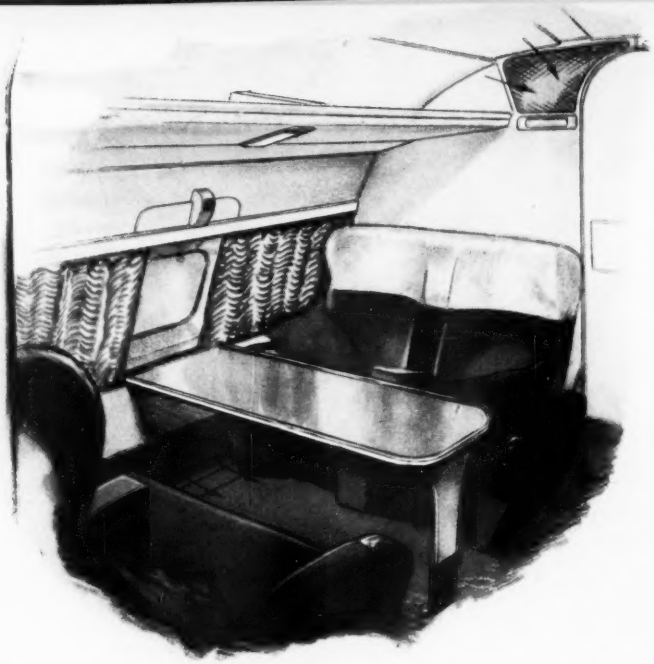




THE actual shades in which the interior scheme of the B.O.A.C. Comet is carried out are not easily reproduced with complete fidelity, but in this colour-sketch by a "Flight" artist, the reproduction is sufficiently close to give a good idea of the restraint and admirable taste in which this magnificent aircraft has been appointed. The detail plan below shows the 44-seat arrangement which may supplement the 36-seat versions that will first go into service. Reduction in the light-luggage stowage volume and elimination of the stewardess's desk, plus a slight reduction in seat pitch, permits eight more chairs to be accommodated.



COMET DECOR . . .



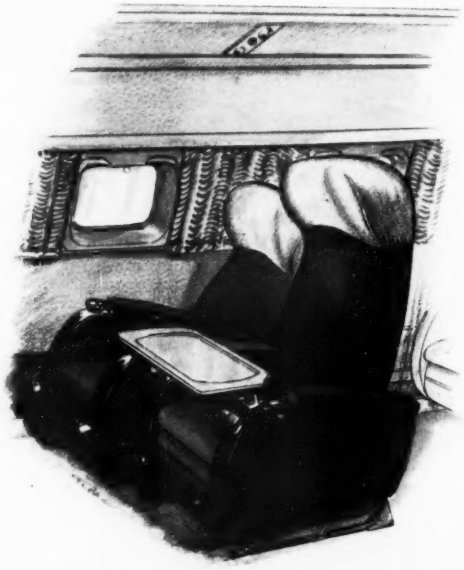
On the right is a vignette of the port forward corner of the eight-seat front cabin. The grille in the head of the bulkhead covers the extractor vent for cabin air re-circulation.

(Below, left) Detail of the beautifully-designed and cleverly planned galley, showing the electric oven, tip-up seat for the steward, fitted cupboards and, through the door, a glimpse of the forward cabin.

that one is sitting in a tube. The overhead racks for light luggage assist in this regard as well.

Marking the forward end of the main 28-seat cabin is a structural bulkhead with a large curtained doorway giving into an eight-seat forward cabin. This has fixed chairs in facing pairs separated by removable Wareite plastic-veneer-topped tables. The doorway in the forward end-wall of this compartment is fitted with a base-hinged flap, which can be lowered to form a servery table. Thus, the steward can pass food-trays and drinks, etc., through from the galley to the stewardess in the cabin without constantly opening the main door between galley and cabin. The galley is unusually spacious and is furnished with cabinet and cupboard units in bright-buffed Alclad; these are arranged athwartships in the rear starboard corner of the flight deck, fore and aft of the crew entry door. The complementary space to port is utilized as a luggage and freight hold, and is equipped with lockable doors.

station is a dry-air-sandwich window set in a splayed surround of beige-grey plastic and curtained with wavy candy-striped linen in Indian-red and white. As in the foyer, the floor of the cabin is covered by a deep-pile carpet of dark blue, which is carried up the base of the walls to form a wainscot, in which are arranged the air-entry ducts of the cabin conditioning system. The walls and ceiling of the cabin are finished in leather-cloth of a cool grey shade and, ingeniously, this is formed in flat panels running the length of the cabin. We say ingeniously, because this simple device seems largely to negative any impression



The sumptuous, fully adjustable chairs are entirely individual units so that occupants of adjacent seats need not inconvenience one another. Above them are pre-focused reading lights and a steward-call button.

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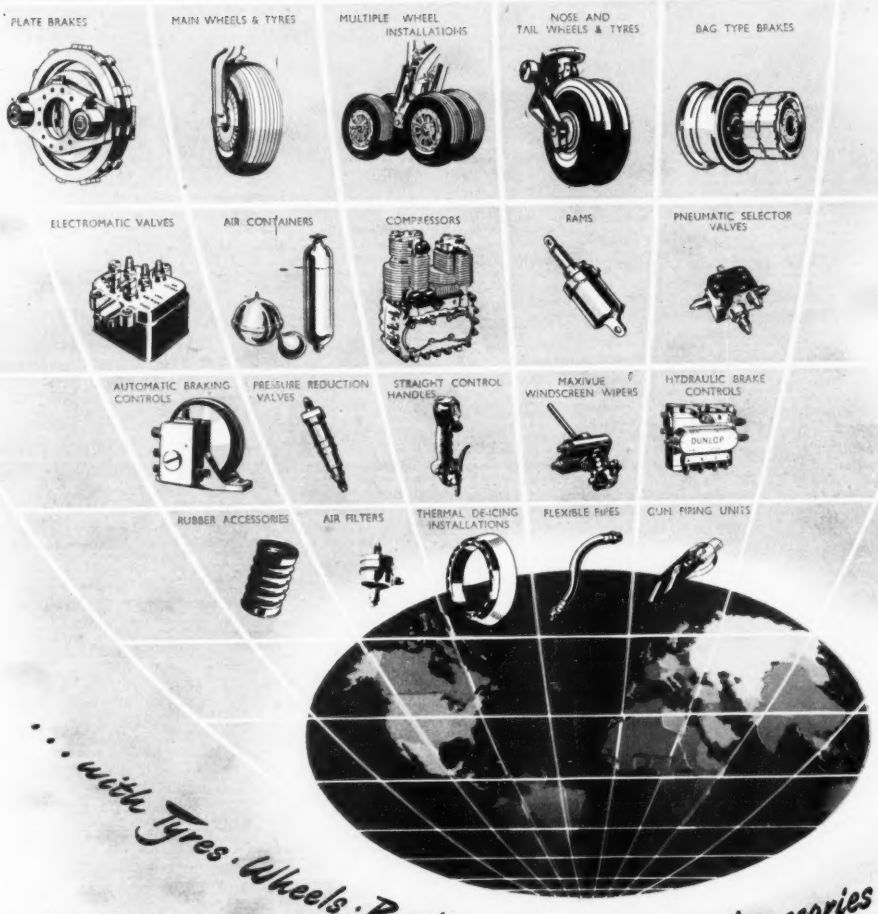

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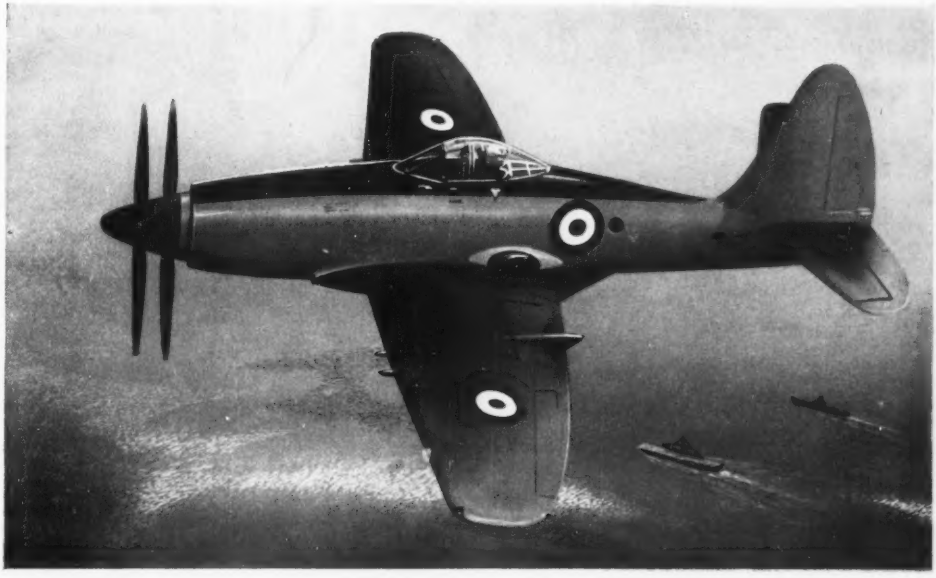

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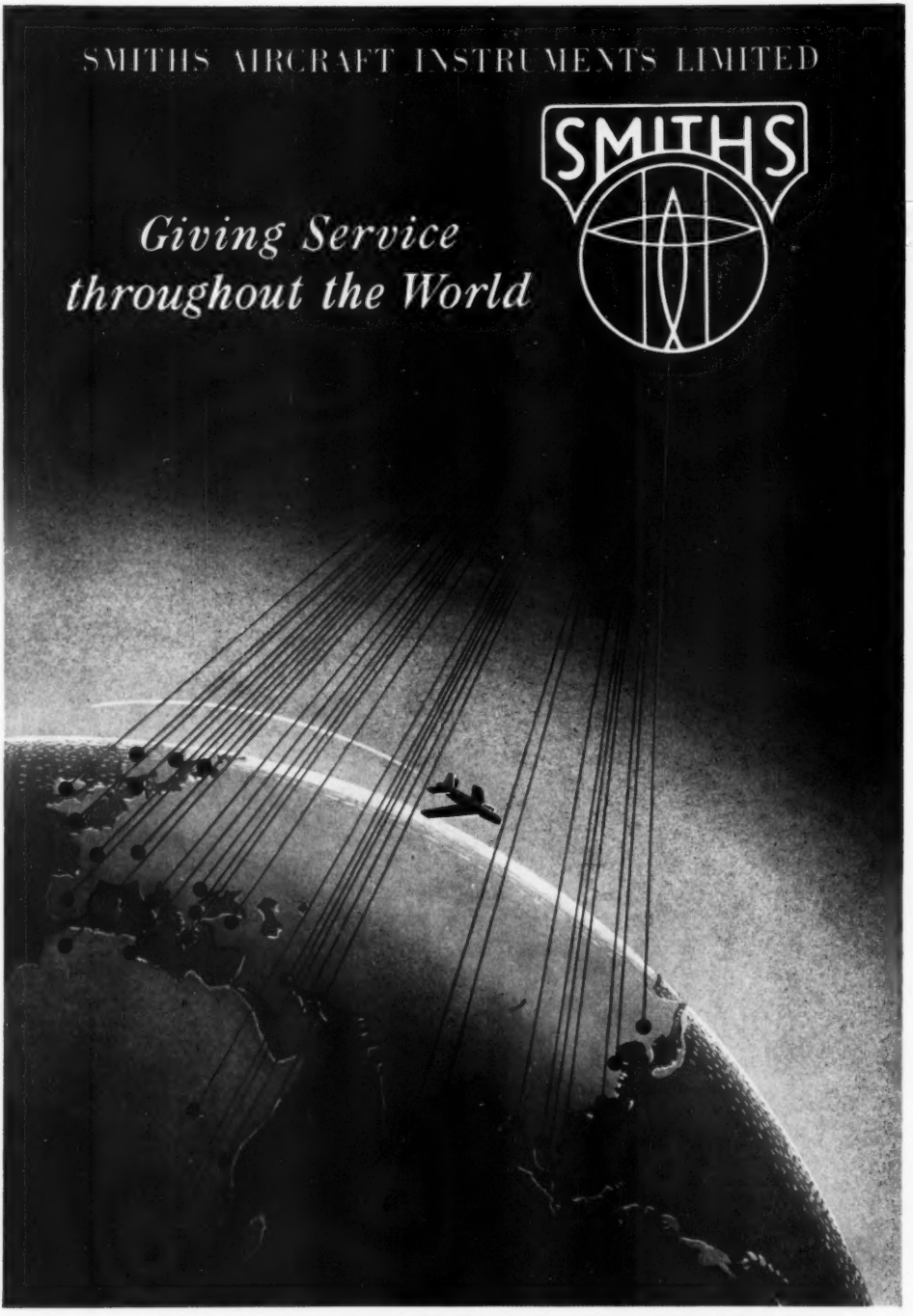
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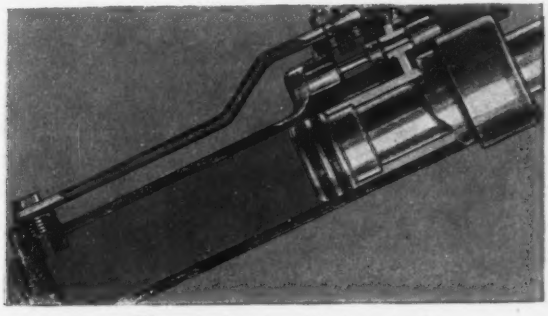

Diagrammatic section of the 'Servodyne', showing differential piston and simple valve control.

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POWER from Pistons and Jets

A Review of British Aircraft Engines in Production or Under Development

THE opinion is still to be heard that Britain is prematurely pinning her faith on the gas turbine for civil aircraft, and the conservative outlook is apparent in the orders still being placed for piston-engined airliners which cannot be delivered for at least two years. We do not agree with the die-hard view: the progress of the past year has done much to dispel any lingering doubts as to the wisdom of preparing to introduce turboprop and turbojet aircraft on scheduled passenger services as soon as they can be readied. The D.H. Comet will be in operation early next year, and we have every faith in its ability to "sell" high-speed, over-weather turbine travel to its passengers and to foreshadow the passing of large piston-engined transports.

Three or four years ago somewhat similar doubts were expressed regarding the adoption of turbojets for all military aircraft; yet today only the more elementary trainers and a few aircraft for special duties are thought likely to retain piston-engine power. A parallel development is foreseen in civil aviation. Past experiences indicate the way in which military aviation under the impetus of war and fear of war is inevitably followed at a more leisurely pace by civil aviation, developing in its different atmosphere.

The many engineers who have studied the industry's requirements have planned well, and there seem to be only three thin spots in the power pattern which might perhaps have been filled before now. First there is the 500-1,000 h.p. bracket in which a British radial piston-engine would almost certainly find a ready market. Helicopters in particular, and the feederliner and light-twin trainer types, come to mind in this connection. Secondly, there is no lightweight unit in the 40-60 h.p. class, and plans for new ultra-light aircraft have been complicated by this deficiency. Thirdly, there has been a lack of choice of large commercial piston engines designed originally for the work.

Of these three classes it may be stated that the Alvis company are believed to be taking the first requirement in hand; the second remains a problem, chiefly because of the lack of money and capacity, although the makers of certain motor cycle and small stationary engines have indicated their willingness to co-operate. A good case can be made for permitting the limited import of light engines. In the third case, the subject daily becomes of less import because several turboprops and turbojets are being developed specifically to take over the work. The Bristol Proteus, for example, will power the Bristol 175s, and Ghosts the first Comets. An outstanding military turbojet, the Avon, will be adapted for use in the Mk. II Comet.

A spate of new units would not be expected at this time, for a sufficiency of new designs appeared shortly after the war. Rather are the manufacturers concerned with the work of development and of matching power units to airframes in order to speed the production of the new generation of aircraft. Nevertheless, the name of the Bristol Olympus is a new one, and there are indications that it will have many novel features. We welcome, in addition, a fascinating newcomer in the Napier Nomad, illustrated in these pages for the first time. The product of several years' research and development, this unique compounded unit is designed for extreme fuel economy.

Rocket motors have been slow in making their appearance, but two are now known to have flown, and both are in the auxiliary category. The D.H. Sprite cold rocket is intended primarily for take-off assistance, and a pair has been tried out in the Comet. The second newly announced unit is the Armstrong Siddeley Snarler. This is intended to boost fighter performance on the climb and at high altitudes. In this connection it may be added that reheat (or afterburning) has not been neglected in the development programmes.

Of the many other power units we can here single out but a few examples. Their makers may be justly proud of the record of achievement to date of the axial Avon and Sapphire turbojets. The Royal Navy have been encouraged by the satisfactory development of the Double Mamba for carrier operation. B.E.A., who have recently started to operate Dart turboprops in two freighters to gain experience, have little cause for worry about the forthcoming introduction of Viscounts on this score.

By the very nature of their routine work, the Gipsy Majors and Queens continue unobtrusively to enhance their already enviable reputation. No news being good news of an established engine, they prefer to be heard regularly, not regularly heard of.

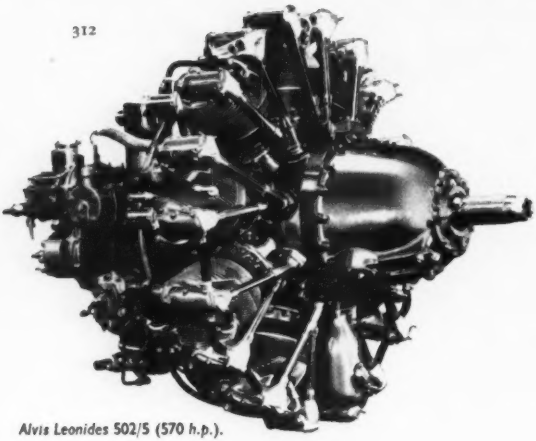
Today the introduction of a new engine design, even if it be of modest proportions, is an extremely expensive business, and the development and setting are costly also. Blackburn and General Aircraft have done well since the war to launch a new and advanced series of in-line engines with direct fuel injection, headed by the now type-tested 180 h.p. Bombardier.

Finally, we pay tribute to the remarkable skill in design and development which has brought early success to the Avro Canada Orenda axial turbojet, in spite of its being only the second turbine unit to be produced by the thriving young industry in that country.

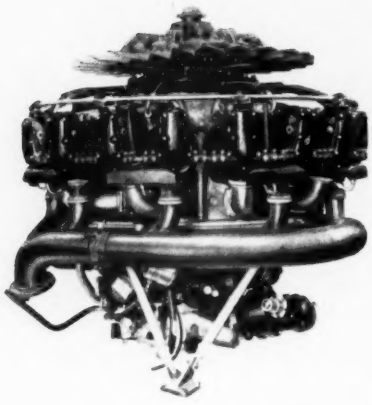
Alvis, Ltd.

THE nine-cylinder radial Leonides is at present the company's only aircraft unit, but it is understood that a fourteen-cylinder design is under consideration, to meet the requirements for a rather more powerful engine. It would employ many Leonides components, and some experience could be drawn from pre-war two-row designs with which the name of Alvis was associated.

The company has had a very successful year, and the main problem is to step up production to meet greatly increased demands for helicopter units, vertically mounted, for the Bristol 171 and 173, and the Westland S.51, and for the standard units to be installed in Percival Princes and

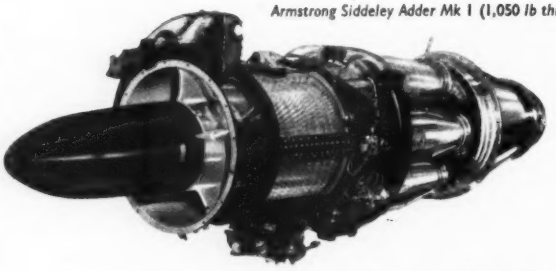


Alvis Leonides 502/5 (570 h.p.).

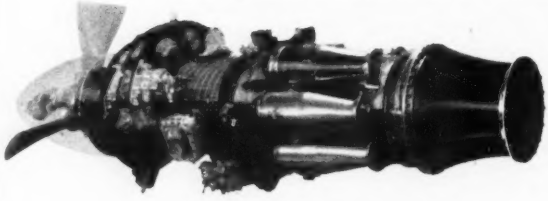


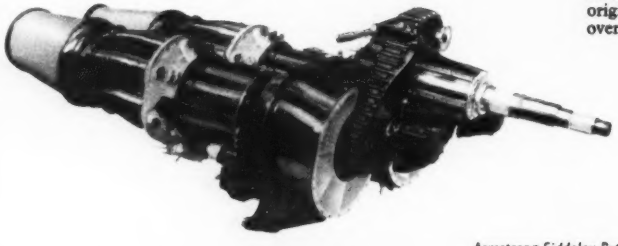
Alvis Leonides helicopter power unit (565 h.p.).

Armstrong Siddeley Adder Mk 1 (1,050 lb thrust).



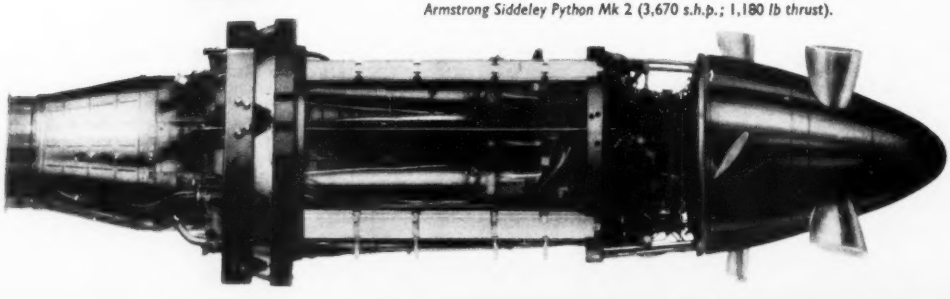
Armstrong Siddeley Mamba (1,320 s.h.p.; 405 lb thrust)





Armstrong Siddeley Double Mamba ASMD1 (2,640 s.h.p.; 810 lb thrust).

Armstrong Siddeley Python Mk 2 (3,670 s.h.p.; 1,180 lb thrust).



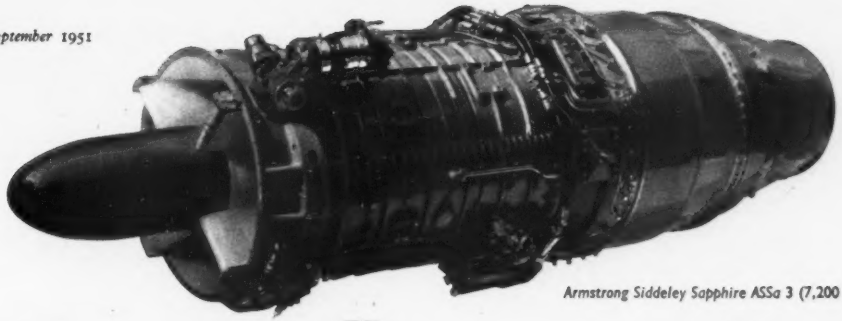
POWER FROM PISTONS

Provosts. Very recently a licensing agreement has been discussed with the Italian government with a view to Leonides being built in that country. *Alvis, Ltd., Coventry.* (*S.B.A.C. Stand R.*)

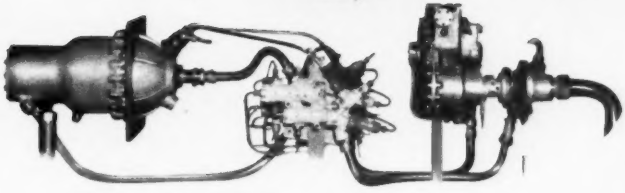
Armstrong Siddeley Motors, Ltd.

TURBOJETS and turboprops are the primary interest of this company, although the perennial Cheetah radial is still listed and produced. In addition, the existence of a rocket motor named the Snarler, which has been under development since 1947, has been revealed. The Snarler is cleared for flight and has been flown in a converted P.1040, redesignated P.1072. Fuels used at present are liquid oxygen and methanol-water, and the designed endurance is three minutes at full thrust.

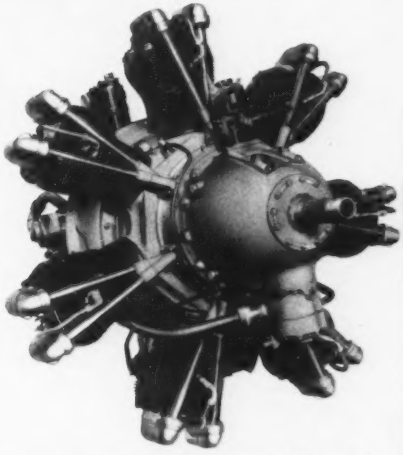
The Sapphire ranks as one of the most important axial turbojets now in existence, and it is being put into production both at home and under licence in America. It also has the highest type-tested thrust figure announced to date, and is unusual in having an annular combustion chamber. The original design was the work of Metrovick but was handed over as part of an overall Ministry of Supply policy. Metro.



Armstrong Siddeley Sapphire ASSa 3 (7,200 lb thrust).



Armstrong Siddeley Snarler ASn 1 Rocket.



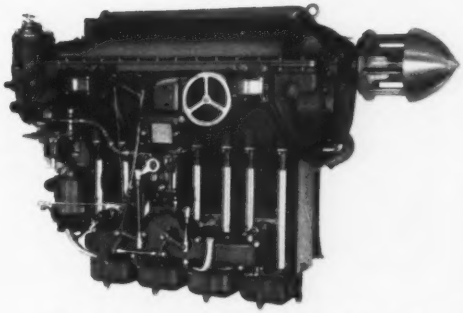
Armstrong Siddeley Cheetah 17 (430 h.p.).

AND JETS . . .

vick, who also produced the Beryls in the S.R/A.1, no longer build aircraft gas turbines. Sapphires are to be installed in American Canberras.

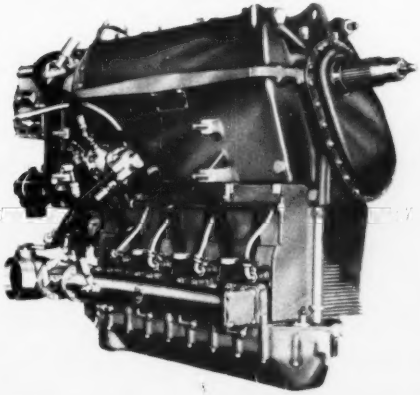
Among the company's turboprop units the Double Mamba—in production for the Navy—is of particular interest in being designed to run as two independent units, thus allowing one half to be shut down or started according to requirements during a flight. Civil versions of the Mamba, most compact of turboprops, continue to fly in several prototypes. The Python was the first Armstrong Siddeley turboprop, and this large and powerful unit is in small-scale production—also for the Navy.

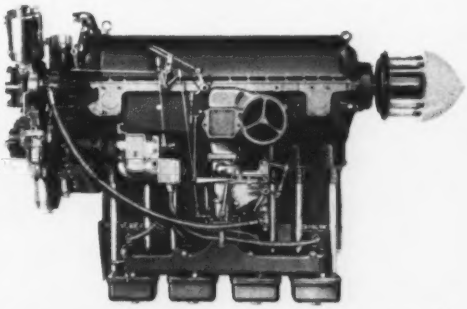
Bearing a marked similarity to each other, and having features in common with the Mamba, the Adder and Viper are both small axial turbojets, but the latter is an expendable unit for target aircraft. It has been designed for a life of ten hours, and cheap materials are used wherever possible. It has the remarkable weight/power ratio of 0.24 lb per lb thrust. An Australian pilotless research and target-type aircraft is to have Viper power. The piloted prototype flew early this year with an Adder installed. *Armstrong Siddeley Motors, Ltd., Coventry.* (*S.B.A.C. Stand N.*)



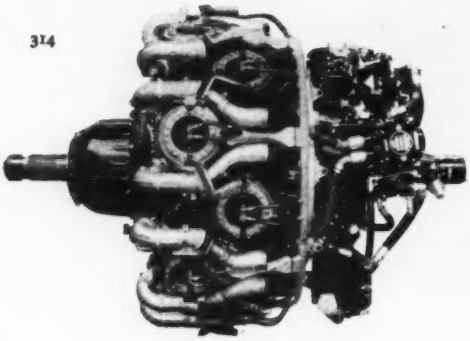
Blackburn and General Aircraft Cirrus Minor II 100 (h.p.).

Blackburn and General Aircraft Cirrus Bombardier 702 (180 h.p.).

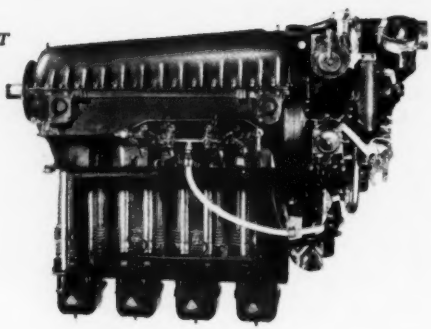




Blackburn and General Aircraft Cirrus Major III (158 h.p.).



Bristol Hercules 734 (2,020 *h.p.*).



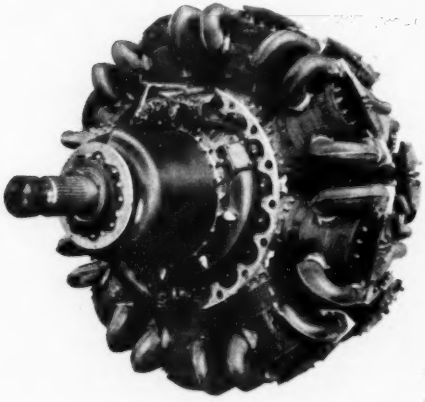
de Havilland Gipsy Major 10 (145 *h.p.*).

POWER FROM PISTONS AND JETS . . .

Blackburn and General Aircraft Ltd.

IMPORTANT overseas orders continue to come the way of Cirrus units, and home consumption is at a healthy level. Major IIIs are to power the 300 Indian H.T.2 trainers recently ordered, and the new Bombardier with direct fuel injection is expected to find applications in such aircraft as the Auster Model S for A.O.P. duties and the Skeeter helicopter, prototypes of which are already flying with the aid of its 180 h.p.

Cirrus Minors and Majors have now built up a vast background of operating experience in a variety of private-owner types at home and abroad. All three of these Cirrus types have four cylinders. They have been installed principally in Auster and Miles Aircraft. *Blackburn and General Aircraft, Ltd., Brough, East Yorks. (S.B.A.C. Stand K.)*

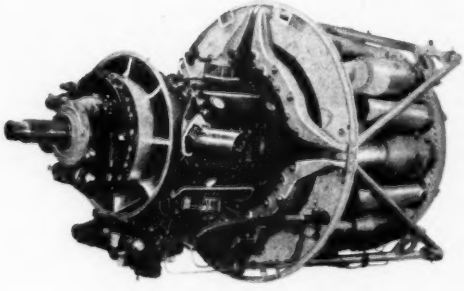


Bristol Centaurus 57 (2,820 *h.p.*).

The Bristol Aeroplane Co., Ltd.

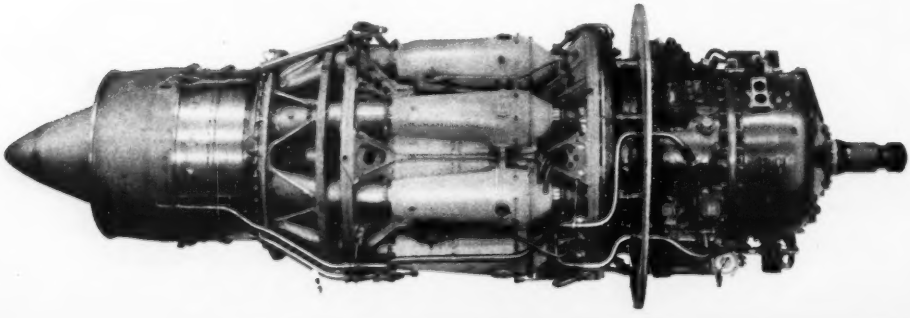
IN spite of its heavy development programme for gas turbines, the Bristol company has continued its production and improvement of Hercules and Centaurus radial piston-engines for military and civil installations. These remain unique in their class in utilizing sleeve-valves, and an outstanding record for service is now being built up by several marks of Hercules—in particular, the 634, which, as employed in the Vikings of B.E.A., has an overhaul period of 1,050 hours. Trial overhaul periods of 1,200 hours have been authorised for certain Hercules 634s. Centaurus are about to go into airline service as the power units of B.E.A.'s Elizabethans (Airspeed Ambassadors).

An entirely new unit, the Olympus is still security-

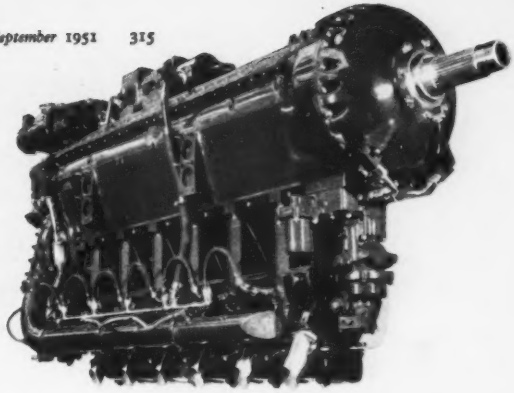


Bristol Proteus 2 (3,200 *s.h.p.*; 800 *lb thrust*).

Bristol Theseus 501 (2,220 *s.h.p.*; 825 *lb thrust*).



de Havilland Gipsy Queen 30 (250 *h.p.*).



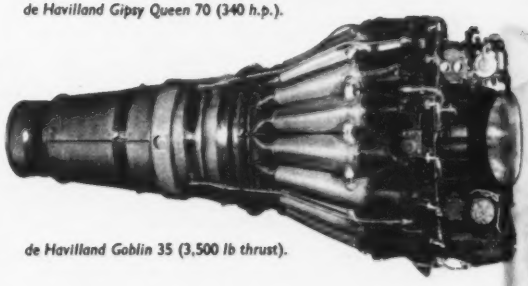
de Havilland Gipsy Queen 70 (340 *h.p.*).

veiled, but this and other gas turbines are understood to be the subject of licensing agreements with America.

Pride of place at Farnborough will be given to the Proteus and Coupled Proteus—the turboprops, now well advanced in development, for the Bristol 175, second Brabazon and Princess. Like the other smaller Bristol turboprop design, the Theseus, of which four are installed in the Hermes V, it has axial and centrifugal compressors, and the free-turbine arrangement which makes for flexibility, simplicity of control and operational efficiency. The company has the great advantage of comprising both engine and aircraft-producing sections, and thus the problem of understanding the other man's requirements is easily overcome. *The Bristol Aeroplane Co., Ltd., Filton, Bristol.* (*S.B.A.C. Stand J.*)

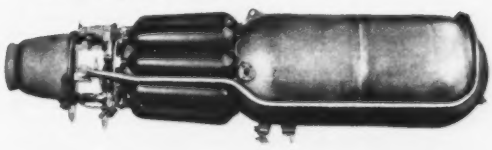
The de Havilland Engine Co., Ltd.

THIS company has nicely divided interests in both high-powered and low-powered engines. In the former category are turbojets for military and civil application, and in the latter the familiar range of small in-line Gipsy piston engines. It is indeed gratifying that quite apart from export orders for de Havilland turbojets built by the parent concern, three countries have marked their approval by negotiating licence-to-build agreements, and thus both Goblins and Ghosts are in production in Sweden; Ghosts in Switzerland; and in Italy, Fiat and Alfa are also building them. All these units are being produced for military purposes, but at home, in addition, civil Ghosts in the Comets have been giving satisfactory and promising service. All de Havilland turbojets announced to date have single-sided centrifugal compressors with direct-entry intakes.



de Havilland Goblin 35 (3,500 *lb thrust*).

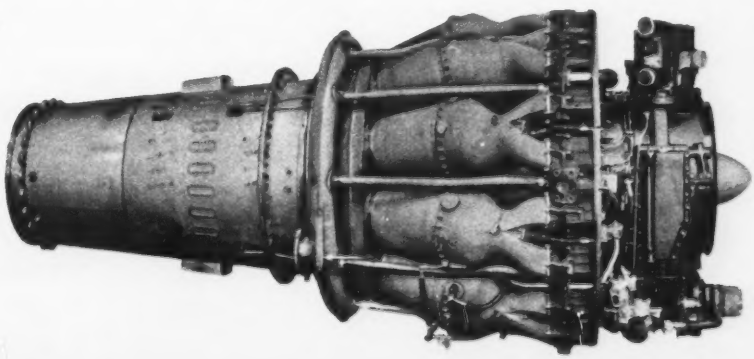
de Havilland Sprite (5,000 *lb thrust*).

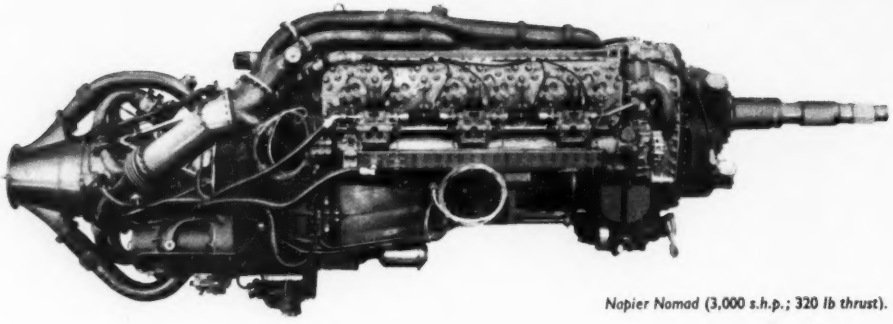


Since its appearance at Farnborough last year the de Havilland Sprite rocket motor has been further developed, and first flight tests have been carried out in a Comet. It is, of course, a cold rocket using hydrogen peroxide, with a catalyst for fuel.

Mark 2 versions of the Queen 70 and Queen 30 have been developed, respectively, for the Series 2 Doves and the Herons and they bring with them an improved aircraft performance. Gipsy Majors are currently being installed in Chipmunks for the R.A.F. and also in a number of civil aircraft.

de Havilland Ghost 50 (5,000 *lb thrust*).





Napier Nomad (3,000 *s.h.p.*; 320 *lb thrust*).

POWER FROM PISTONS AND JETS . . .

Further evidence of the company's active interest in reheat will be seen at Farnborough this year. Flight tests have been carried out with a reheat Ghost in a Venom F.B. Mk. 1. The Ghost-powered Vampire still holds the world's official altitude record. *The de Havilland Engine Co., Ltd., Stonegrove, Edgware, Middlesex.* (*S.B.A.C. Stand H.*)

D. Napier and Sons, Ltd.

AFTER a long incubation period, Napiers have hatched their Nomad, and permission to display an example at the S.B.A.C. Exhibition has been granted. This long-established company, noted especially for the Lion and Sabre, will thus make a welcome return among exhibitors of large aircraft engines. Since the war, the Naiad turboprop, shelved in view of even more important commitments, had been the only new unit. Lest the impression be given that Napiers have been over-long in developing the Nomad, it must be stressed that this is a courageous new departure in aircraft power unit design and is the first of its kind to be built and run. Some indication of its nature was given last week (page 261) when the method of working of this class of unit, incorporating two-stroke compression-ignition piston engine, compressors and turbines, was also described.

The 3,000 h.p. Nomad has been designed to give extreme economy and will probably be applied to very-long-range civil and military aircraft.

The illustration shows a development unit and it appears that the gas-producer section is a horizontally-opposed 12-cylinder compression-ignition engine. Exhaust manifolds and ducting are also of an early form. I.C. engines are normally associated with stationary engines or heavy road vehicles running on P.B.O. (Pool Burning Oil) and their very high compression-ratio results in the need for sturdy construction and usually, considerable weight. *D. Napier and Son, Ltd., 211, The Vale, Acton, London, W.3.* (*S.B.A.C. Stand A.*)

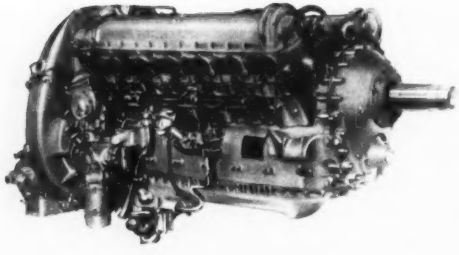
Rolls-Royce, Ltd.

IT must be with some reluctance that Rolls-Royce engineers slowly but surely turn their backs on piston engines in order to concentrate on gas-turbine development and their prodigious task of Avon turbojet production. The name Merlin has become almost a household word, and, of course, both Merlins and the rather larger Griffons continue to serve in military and commercial aircraft. A wide background of experience, which has included not only engine design but the development of whole aircraft installations, has provided the company with the knowledge needed to produce wholly reliable turbine units for civil airliners and a variety of military aircraft. The Canberra, Valiant and Swift, for example, owe much of their remarkable performance to their axial Avon turbojets, and great things are expected of the Mk. 2 Comets which are also to have Avons installed.

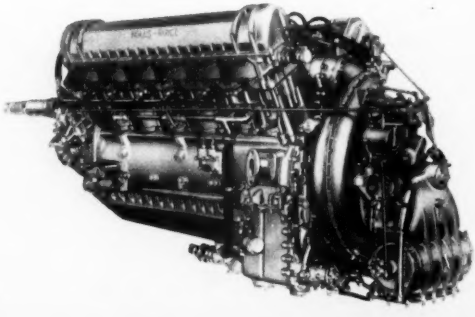
The ready, trouble-free power provided by Derwents and Nenes—both of which designs have been licensed for production abroad—has also much simplified the work of development on the many prototypes in which they have been installed, and, of course, several current fighters, notably the Meteors, depend upon one or other of these turbojets.

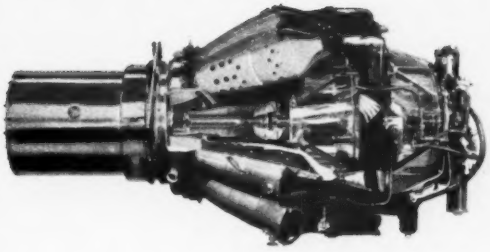
To the Dart goes the honour of being the first turboprop to go into commercial service. Already trial flights carrying fare-paying passengers have been made. Next year, with the delivery of Viscounts, B.E.A. will begin regular turboprop-powered services, and a first overhaul period for the Darts will probably be in the region of 500 hours, judging from

Rolls-Royce Merlin 620 (1,760 *h.p.*).

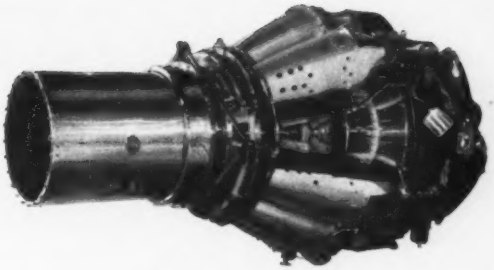


Rolls-Royce Griffon 57 (2,500 *h.p.*).

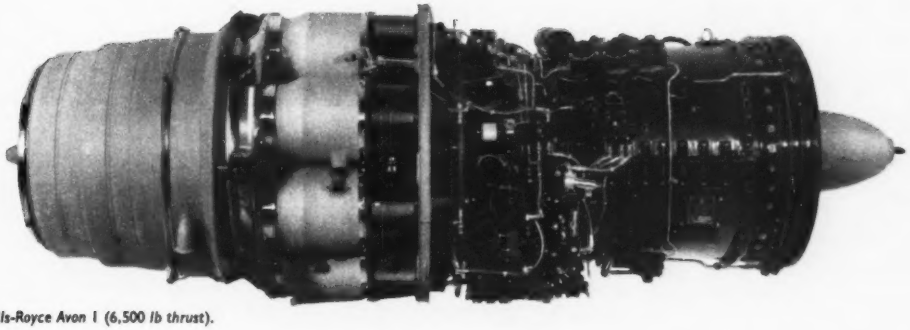




Rolls-Royce Derwent 8 (3,600 lb thrust).

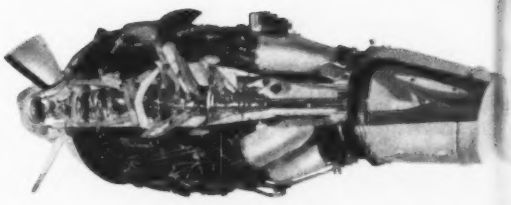


Rolls-Royce Nene 4 (5,100 lb thrust).



Rolls-Royce Avon 1 (6,500 lb thrust).

experience to date. Two Dart-powered Dakotas (Pionairs) are now providing additional operational information while serving as freighters with B.E.A. *Rolls-Royce, Ltd., Derby.* (*S.B.A.C. Stand B.*)

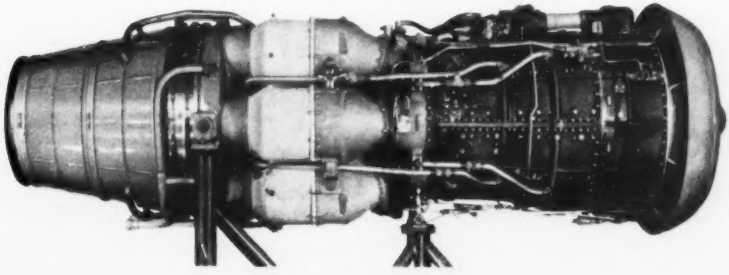


Rolls-Royce Dart 504 (1,400 s.h.p.; 365 lb thrust).

A. V. Roe Canada, Ltd.

IT is with pleasure that we again include the Canadian Orenda in this year's review of aircraft power units. Only limited information has been released, but there is enough to indicate the promise of this advanced axial design, the capabilities of which have already been demonstrated in flight.

Superficially it bears a resemblance to the Avon, and, moreover, it is almost interchangeable with it. The power output quoted only as "over 6,000 lb thrust" also places it in a similar class. *A. V. Roe Canada, Ltd., Malton, Ontario, Canada.* (*Hawker Siddeley Group, S.B.A.C. Stand N.*)



Avro Canada Orenda (over 6,000 lb thrust).

BRITISH PISTON ENGINES

Maker's name and engine type	Arrangement of cylinders	Bore × stroke (in)	Capacity (litres)	Take-off power b.h.p.	Max Power Rating				Representative Cruising Power				Fuel consumpt. max. w.m. (gall/hr)	Dry weight (lb)	Remarks
					b.h.p.	r.p.m.	Boost lb/sq in	Height (ft)	b.h.p.	r.p.m.	Boost lb/sq in	Height (ft)			
ALVIS:															
Leonides 502/5	9R	4.80x4.4	11.78	560	570	3,000	8	1,750	330	2,600	0	11,000	22	790	
Leonides 521/1	9R	4.80x4.4	11.78	520	535	3,000	6.5	3,250	355	2,800	0	12,000	23.5	790	Helicopter unit
Leonides 524/1	9R	4.80x4.4	11.78	545	565	3,200	7	4,000	340	2,700	0	11,500	22.5	645	Helicopter unit. Direct drive
ARMSTRONG SIDDELEY:															
Cheetah 17 ...	7R	5.25x5.5	13.66	420	430	2,550	4	2,500	280	2,100	0	7,000	19	805	
Cheetah 27 ...	7R	5.25x5.5	13.66	475	405	2,425	2.75	4,000	280	2,100	0	7,000	19	805	
BLACKBURN AND GENERAL AIRCRAFT:															
Cirrus Minor II	4IL	3.94x5.0	3.98	92	100	2,600	—	S.L.	78	2,200	−2	3,250	5.2	240	
Cirrus Major III	4IL	4.72x5.5	6.33	146	158	2,450	—	S.L.	138	2,200	−1.5	1,500	9.3	345	
Cirrus Bombardier 702 ...	4IL	4.8x5.5	6.524	180	180	2,600	—	S.L.	140	2,200	−2	3,250	9.6	354	Direct fuel injection
BRISTOL:															
Hercules 763 ...	14R	5.75x6.5	38.7	2,100	2,160	2,900	16.5	4,000	1,220 1,135	2,400	4	12,500 22,500	77.5	2,400	
Hercules 758 ...	14R	5.75x6.5	38.7	2,040	2,090	2,800	13	3,000	1,215	2,400	3.5	10,750	74.5	2,140	
Hercules 734 ...	14R	5.75x6.5	38.7	1,980	2,020	2,800	13	2,750	1,220	2,400	3.5	10,500	75	2,100	
Hercules 264 ...	14R	5.75x6.5	38.7	1,950	1,990	2,800	13	2,750	1,125 1,065	2,400	2.5	11,750 19,500	70.8	2,315	
Centaurus 661	18R	5.75x7.0	53.6	2,625	2,705	2,800	13.5	4,000	1,675 1,575	2,400	3.5	11,500 17,500	101	3,400	
Centaurus 57...	18R	5.75x7.0	53.6	2,810	2,820 2,600	2,700	11.5	500 14,250	1,745 1,400	2,400	2.5	11,000 21,250	106	2,830	T.O. and max. power with water/methanol
Centaurus 18...	18R	5.75x7.0	53.6	2,470	2,550 2,280	2,700	9.5	4,000 16,500	1,745 1,600	2,400	2.5	11,000 21,250	106	2,920	
Centaurus 20...	18R	5.75x7.0	53.6	2,470	2,550 2,280	2,700	9.5	4,000 16,500	1,745 1,600	2,400	2.5	11,000 21,250	106	2,570	Paired in Brabazon I
DE HAVILLAND:															
Gipsy Major 10	4IL	4.65x5.5	6.124	145	145	2,550	—	S.L.	125	2,300	−2	3,000	11	312	
Gipsy Queen 30	6IL	4.73x5.5	10.178	250	250	2,500	—	S.L.	217	2,500	−2	2,900	13	560	
Gipsy Queen 70	6IL	4.73x5.9	10.178	345	340	2,800	6	S.L.	265	2,400	2	8,000	17.5	660	
ROLLS-ROYCE:															
Griffon 57 ...	12V	6.0x6.6	36·7	2,455	1,985 1,800	2,750	18	1,500 9,750	1,360 1,265	2,400	9	6,000 12,500	87 85	2,100	T.O. with water/methanol
Merlin 626 ...	12V	5.4x6.0	27	1,760	1,500 1,420	2,850	14	7,750 18,750	1,175 1,160	2,650 2,850	9	10,250 23,500	75 86	1,790	
Merlin 35 ...	12V	5.4x6·0	27	1,280	1,245	3,000	9	11,500	755	2,100	4	6,750	46	1,520	

R—Radial. I.L.—Inverted in-line. V—Vee form. S.L.—Sea level.

TURBOJETS, TURBOPROPS, COMPOUNDED and ROCKET MOTORS

Maker's name and engine type	Compressor types and no. stages	No. of combustion chambers	Max. Power Rating (sea-level static)				Representative Cruising Power					Diameter or width* (in)	Length (in)	Weight (lb)	Remarks
			Thrust (lb)	Shaft h.p.	r.p.m.	Spec. consumption lb/hr/lb or e.s.h.p.	Thrust (lb)	Shaft h.p.	r.p.m.	Height and Speed	Spec. consumption lb/hr/lb or e.s.h.p.				
ARMSTRONG SIDDELEY:															
Sapphire ASSa3	A	1 Ann.	7,200	—	Res.	0.91	Res.	—	Res.	Res.	Res.	37.5	133.8	2,500	
Adder Mk. 1 ...	10A	6	1,050	—	15,000	1.065	330	—	14,250	350 at 30,000	1.29	26	86.72	580	Experimental only
Viper ASV2 ...	10A	1 Ann.	1,500	—	15,000	1.15	Res.	—	Res.	Res.	Res.	23.25	65.4	365	Expendable unit
Double Mamba ASMD1 ...	(10A)x2	2 x 6	810	2,640	15,000	0.735	220	1,400	14,500	300 at 20,000	0.68	52.8*	101.8	2,050	Double engine
Python Mks. 2 and 3	14A	11	1,180	3,670	8,000	0.81	345	2,130	7,800	300 at 20,000	0.725	54	123.2	Mk. 3, 3,450	
Mamba Mk. 504	10A	6	405	1,320	15,000	0.735	355	1,050	14,500	S.L. static	0.775	26	79.8	780	
Snarler ASn1 ...	—	1	Res.	—	—	—	Res.	—	—	—	—	Res.	Res.	Res.	Bi-fuel rocket motor
BRISTOL:															
Theseus 501 ...	8A, 1C	8	825	2,220	8,200	0.866	145	1,170	7,800	300 at 20,000	0.773	54	82.6	2,205	"Free" turbine designs; Coupled Proteus is a double engine
Proteus 2 ..	12A, 1C	8	800	3,200	10,000	0.630	380	1,025	9,500	350 at 35,000	0.510	41.4	113.4	3,200	
Coupled Proteus 2	(12A, 1C) × 2	2 x 8	1,600	6,400	10,000	0.69	760	2,050	9,500	350 at 35,000	0.510	83.26*	149.3	7,180	
NAPIER:															
Nomad	Res.	Res.	320	3,000	Res.	Res.	Res.	Res.	Res.	Res.	Res.	Res.	Res.	Res.	Compounded unit
DE HAVILLAND:															
Goblin 3 ...	1C	16	3,350	—	10,750	1.18	2,250	—	9,500	S.L. static	1.18	49.9	100.5	1,629	
Goblin 35 ...	1C	16	3,500	—	10,750	1.16	2,350	—	9,500	S.L. static	1.16	49.9	100.5	1,629	
Goblin 50 ...	1C	10	5,000	—	10,250	1.08	3,350	—	9,000	S.L. static	1.02	53	121	2,218	Civil unit for Comet
Sprite	—	1	5,000	—	—	—	—	—	—	—	—	20	84	350	"Cold" rocket
ROLLS-ROYCE:															
Nene 4	1C	9	5,100	—	12,500	1.06	4,000	—	11,800	S.L. static	1.02	49.5	97	1,755	
Derwent 8 ...	1C	9	3,600	—	14,700	1.025	3,090	—	14,100	S.L. static	1.03	43	83	1,280	
Dart 504 and 505	2C	7	365	1,400	14,500	0.75	70	880	13,800	300 at 20,000	0.65	38.5	95	929	505 for B.E.A. Viscounts
Avon 1	A	8	6,500	—	7,800	Res.	Res.	—	Res.	Res.	Res.	42.4	119	2,240	
AVRO (CANADA):															
Orenda ...	10A	6	6,000+	—	Res.	Res.	Res.	—	Res.	Res.	1	42	120	2,500	Figures approximate

10A—Axial 10-stages. 1C—Single-stage centrifugal. Res.—Information restricted. S.L.—Sea level.

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FOR FARNBOROUGH SPECTATORS

Dates, Times, Admission Details and Routes

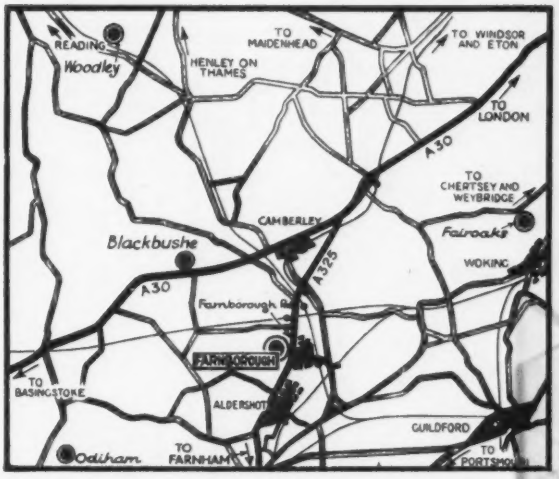
THE S.B.A.C. Flying Display and Exhibition opens at Farnborough on Tuesday next, September 11th, but intending visitors who are not eligible for entry by special invitation should note that the Tuesday, Wednesday, Thursday and Friday are "private" days. The two days on which the show will be open to the general public are Saturday and Sunday, September 15th and 16th. The aircraft park and static show are on view from 10 a.m. on both days, and the flying displays are from 3 p.m. until just after 5 p.m.

Admission prices are : Pedestrians 3s; children (under 16) 2s; cyclists 4s. Vehicles: Motor cycles 2s (riders at pedestrian rates); combinations and three-wheelers (with occupants) 10s; cars (with occupants) 20s; coaches (with occupants) £5; double-decker buses (with occupants) £10. Reserved enclosure 10s per person extra (children 5s). Advance bookings are handled by Auto Parks, Ltd., 1, Maclise Road, London, W.14. (Shepherd's Bush 5385.)

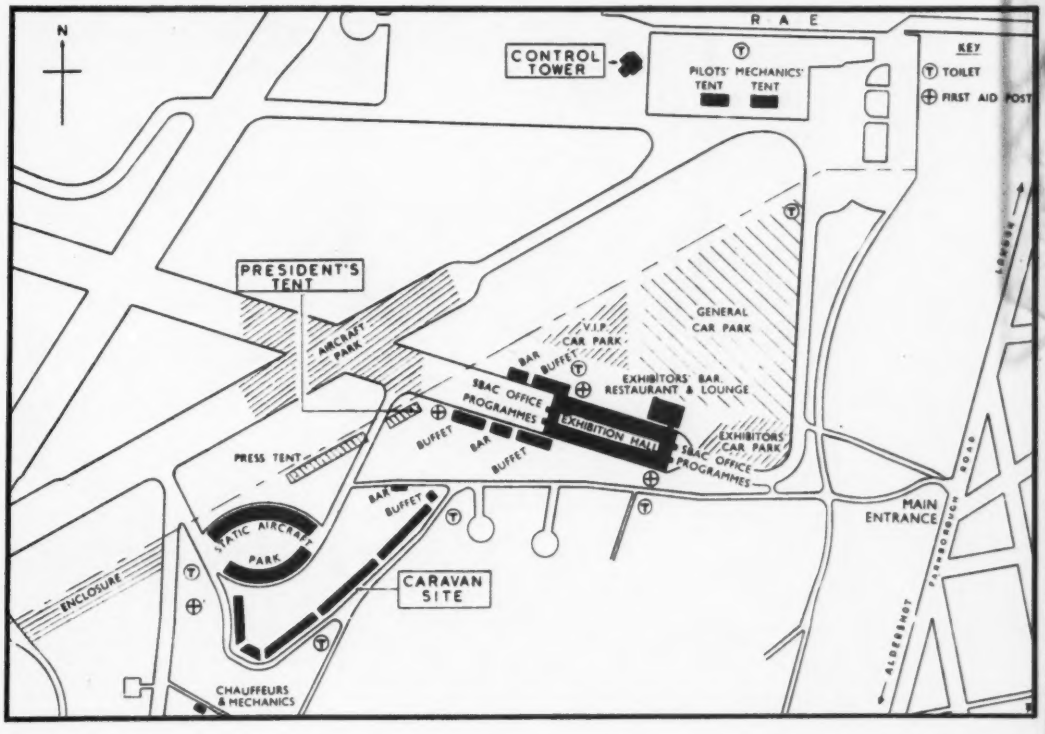
The S.B.A.C. informs us that unless any unexpected official ban is imposed at short notice, there will be no restrictions on the normal use of cameras by the public.

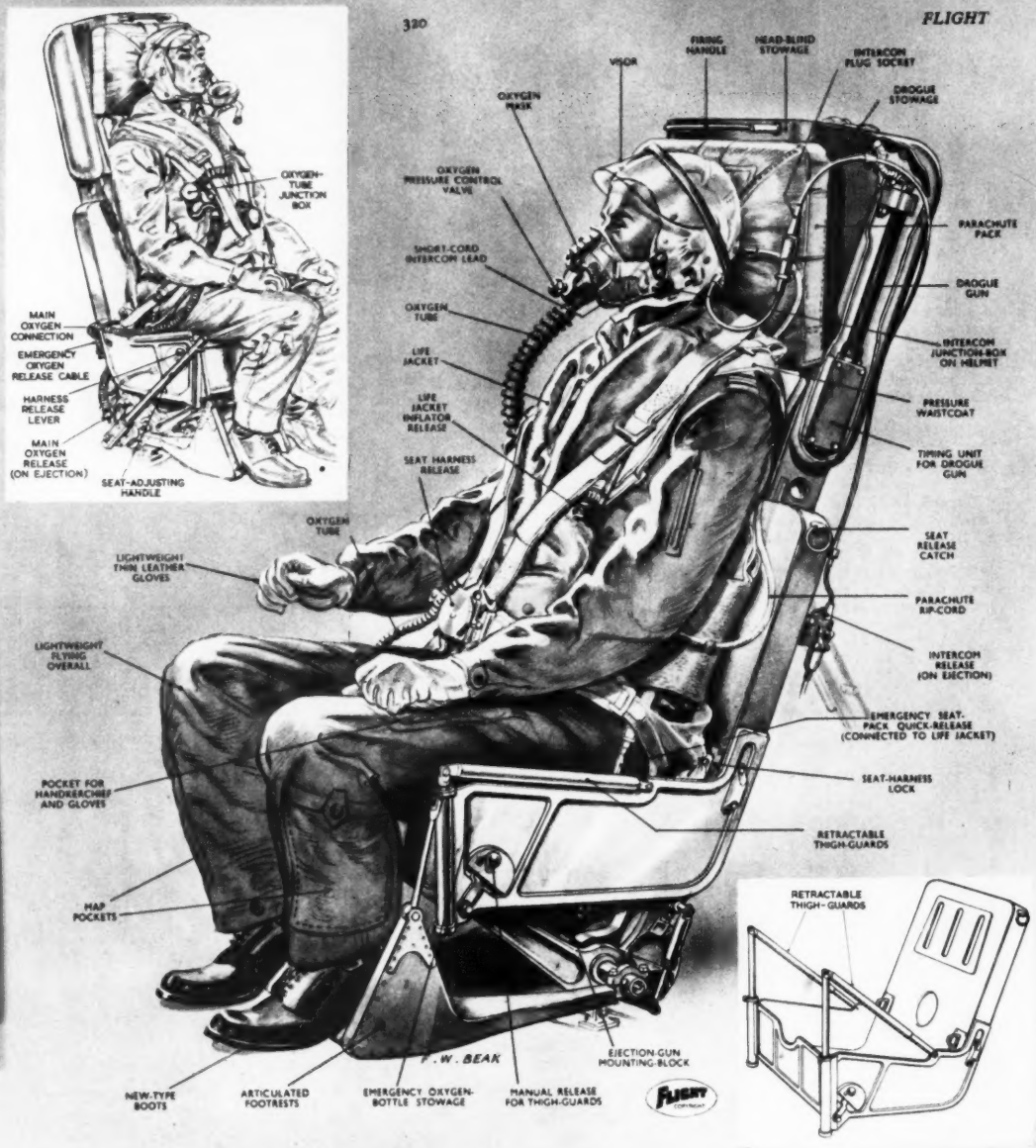
Farnborough can be reached by road *via* the routes shown on the accompanying map. As in past years, the railways and bus companies will run extra services in the area, information on which can be obtained at transport inquiry offices.

Visitors by air cannot be accommodated at Farnborough itself; the nearest convenient airfield is Blackbushe, whence a shuttle-service of motor coaches, for holders of trade badges, will operate from the Tuesday to the Friday.



Above is a map showing the road approaches to Farnborough; in the neighbourhood of the airfield traffic must move as directed by the police. In the diagram below the layout of the enclosures is shown. A floor-plan of the exhibition hall—housing the "static" show—appears on page 326.





Installed and Equipped—
the Modern Service Pilot

FOR their ready co-operation in the preparation of this pictorial feature we acknowledge our indebtedness to the School of Aviation Medicine, at Farnborough, and to the technical staff of the Martin-Baker Aircraft Co., Ltd. Prepared especially for this issue, the drawings display the newest safety devices and accoutrements developed in this country for Service use, and although both the Martin-Baker ejector seat and the pilot's apparel might appear, to the uninitiated eye, somewhat complicated, the reader may be assured that the utmost effort has been directed towards simplification, for from this virtue stems the qualities of lightness, positiveness of operation and freedom of movement.

AUXILIARY SERVICES

Detailed Summary of the Main Components to be Exhibited at Farnborough

ADVANCE information suggests that the "static" section of the S.B.A.C. show will be of even greater technical interest than in the past. The static show is, of course, always an absorbingly interesting collection, where the visitor can see for the first time units which establish new standards of efficiency, economy and safety; where he can examine the latest variants of those he saw introduced the previous year; where, in short, the industry of the British aviation world is displayed for all to see, marvel at and argue over. We list below and on the succeeding pages a detailed summary of the chief auxiliary components which, we are informed by the manufacturers, will be displayed. This section of the review is followed by our customary guide to the general products of what may be termed the ancillary aircraft industry, covering both S.B.A.C. exhibitors and others. A floor-plan of the static show appears on page 326.

AIRSCREWS

De Havilland Propellers, Ltd., Hatfield, Herts (Stand H), will have on view a slowly-rotating four-blade hollow-steel airscrew and spinner for the Proteus turboprop units of the Bristol 175. Supplementing this principal exhibit will be eight hubs for the airscrews of, respectively, the Princess, Shackleton, D.H.A. Drover, Heron, Dove, Hermes, Ambassador and Marathon. This last airscrew recently made the first turboprop reverse-thrust braking landing. A hollow-steel internally-heated blade will also be shown.

The Fairey Aviation Co., Ltd. (Propeller Division), Hayes, Middlesex (Stands E and 44), are continuing the development of their Motogenic electrically-actuated airscrew and are also concentrating on airscrews for the company's helicopter development programme. The fixed-pitch Fairey-Reed airscrews are, of course, still in quantity production.

Hordern-Richmond, Ltd., Haddenham, Bucks (Stand 126), will be showing models of the Aeromatic airscrews which they manufacture under licence from the Everel Propeller Corporation and Koppers Co., Inc. Hy-du-lignum blades for variable-pitch airscrews, helicopter rotor blades and fixed-pitch airscrews are also to be displayed.

Jablo Propellers, Ltd., Mill Lane, Waddon, Croydon, Surrey (Stand 54), are to exhibit various examples of Jablo Wood, the standard material in which airscrews for Spitfire, Firefly and Seafire aircraft, among others, are manufactured.

Rotol, Ltd., Cheltenham Road, Gloucester (Stand 76), will have on view the eight-blade co-axial airscrew of the Fairey Gannet and the three-blade c.s. airscrew exclusively specified for the Percival Provost, these two exhibits standing as representatives for the enormous range of airscrews the company produce. Governor units and sectioned units of Rotol composite blades will also be on view, together with auxiliary drive equipment for the Dart-Viscount and the Canberra. Demonstration panels will illustrate the cyclic application of electro-thermal de-icing for airscrew blades, and the operation principle of the airscrew mechanical stop.

CABIN-ATMOSPHERE CONTROL

D. A. Daniel and Co., Ltd., Mackynlleth, North Wales (Stand 4), are exhibiting representative examples of their range of Dragonfly heaters for cabin conditioning and aerofoil de-icing systems, together with the various accessories—comprising fuel-control unit, combustion air regulator, and rate of flow valve—which appertain to the installation.

Delaney Gallay, Ltd., Vulcan Works, Edgware Road, London, N.W.2 (Stand 121), will have on their stand examples of the range of heat exchangers they manufacture for heating and cooling cabin air. One of the latest types is a steam heater utilizing exhaust waste heat without incurring the risk of carbon monoxide contamination.

Sir George Godfrey and Partners, Ltd., Hampton Road, Hanworth, Middlesex (Stand 45), will be displaying their Type 15 cabin blower which, supplanting the standard American equipment first in T.C.A. North Stars and now in B.O.A.C. Argonauts, has proved an outstanding economy measure. Together with this unit will be shown a two-stage rotary blower for cabin supercharging at extremely high altitude; three examples of the company's regenerative air-cycle turbine cold-air units; the Type R2000 air-conditioning trolley to "ground-condition" the Comet; and to complete the conditioning coverage, examples of the new centrifugal and axial-flow fans produced by the company will be shown.

Jablo Propellers, Ltd., Mill Lane, Waddon, Croydon, Surrey (Stand 54), contribute to the maintenance of cabin comfort with their Aero Jablex, a very-light-weight expanded plastic in resilient form which is particularly suitable for thermal insulation.

M.L. Aviation Co., Ltd., White Waltham, Maidenhead, Berks (Stand 71), have developed a range of mobile ground trolleys for cabin conditioning, notably the Coolairvan, the smaller Coolair and, now, the new Coolair Minor.

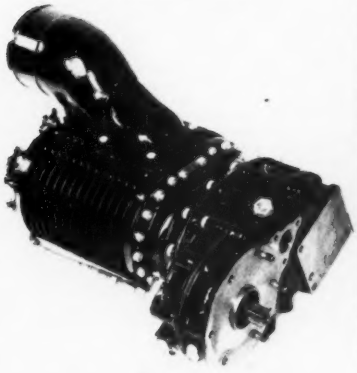
Marston Excelsior, Ltd., Fordhouses, Wolverhampton (Stand 142), will have on view examples of their brazed, light-alloy heat exchangers which, of high-temperature high-pressure air-to-air type, are of the kind fitted to the latest civil and military aircraft.

Normalair, Ltd., Yeovil, Somerset (Stand 172), will show as their main exhibit an animated diagram of the cabin atmosphere control installation of the Comet. This will be complemented by various items of atmosphere-control equipment, including valve units for pressure control and flow control; a humidifier control; and a choke valve for temperature control. The company have recently started design, development and production of oxygen equipment, as a complement to cabin atmosphere conditioning, and to this end are to manufacture under licence certain components of the Bendix Aviation Corporation.

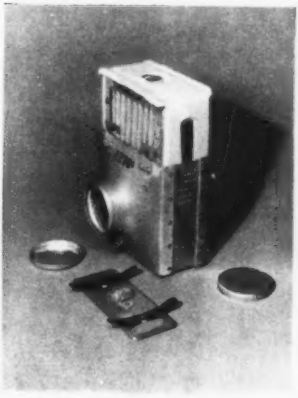
Siebe Gorman and Co., Ltd., Davis Road, Tolworth, Surbiton, Surrey (Stand 110), will be showing various examples of their oxygen-breathing apparatus, both for aircrew and passenger flying at high altitude. Among the company's latest developments are a new lightweight oxygen line, and new designs of control valves, cylinder valves and regulators.

Taddington Controls, Ltd., Cefn Coed, near Merthyr Tydfil, South Wales (Stand 86), are to show a representative range of their temperature- and pressure-control valves and switches, solenoid valves,

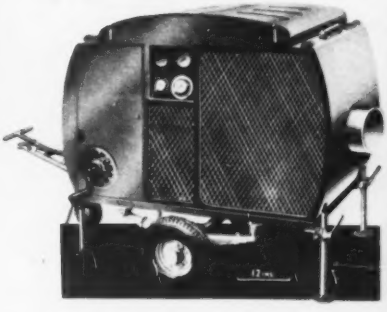
The Type 15 Godfrey cabin blower as now installed in the T.C.A. North Stars and B.O.A.C. Argonauts.



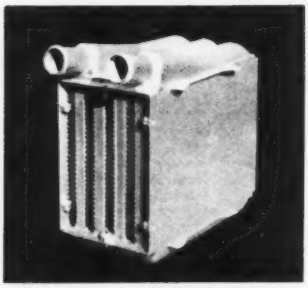
Vokes Millevee filter, used in the cabin pressurization systems of military aircraft.



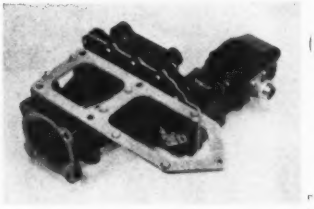
Compactness is a feature of the new M.L. Coolair Minor ground conditioning truck.



AUXILIARY SERVICES . . .



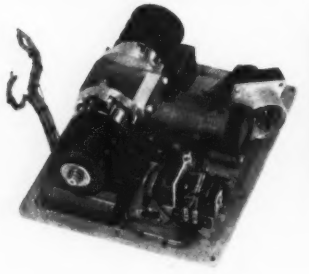
High-temperature, high-pressure air-to-air heat exchanger by Marston Excelsior.



One of the new motorized slatted gate-valves of 3in bore produced by Teddington Controls.

Joseph Lucas combustion heater for use in de-icing or cabin-heating systems.

Teddington heavy-duty cyclic de-icing time switch.



electro-pneumatic/hydraulic jacks, thermostats, inching controls, etc., many of which are incorporated in cabin conditioning systems. Particular interest will be focused on the new range of gate-valves, including those for dealing with hot air.

Vokes, Ltd., Henley Park, Guildford, Surrey (Stand 25), are showing a comprehensive range of their more recent products in the fluid-filtration and silencing fields. A new development is the Thermovee air filter employing glass wool as the filtration medium. It is available both for ramming and non-ramming installations, with a rating of 1,200 and 1,100ft/min respectively. The company produce blower silencers for the Brabazon, Hermes, Ambassador, Viscount and Apollo aircraft, as well as for military types still unmentionable. Disc air filters for silica-gel drier systems, and Millevee filters for jet fighter cabin conditioning, are reported to be much in demand.

DE-ICING EQUIPMENT

D. A. Daniel and Co., Ltd., Machynlleth, North Wales (Stand 4), will show the Dragonfly surface combustion heaters which are as applicable to de-icing purposes as to those of cabin heating. Reference to these exhibits is made in the "Cabin Atmosphere Control" section.

Delaney Gallay, Ltd., Vulcan Works, Edgware Road, London, N.W.2 (Stand 121), manufacture a de-icing heater unit for wings and tail surfaces; it is a light-alloy medium-temperature heat-exchanger employing exhaust gas as the heat source, and air as the distributing medium.

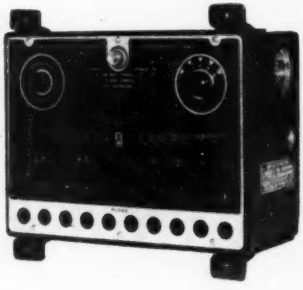
Delco-Remy-Hyatt, Ltd., 111, *Grosvenor Road, London, S.W.1* (Stand 27), will be exhibiting examples of their very wide range of fractional-horsepower motors, many of which are employed to actuate de-icing equipment.

Joseph Lucas (*Gas Turbine Equipment*), *Ltd., Birmingham* 28 (Stand 133), have designed and developed a high-efficiency combustion heater for burning either kerosene or petrol, and which is particularly applicable to thermal de-icing systems.

Rotax, Ltd., Willesden Junction, London, N.W.10 (Stand 134), have developed control equipment for the pulsating rubber de-icing overshoes fitted to the Handley Page Hermes IV. The system incorporates an electronic damper, which gives automatic damping of the inflation cycle according to the requirements of light, medium or severe icing conditions.

T.K.S. (*Aircraft De-Icing*), *Ltd., Drayton House, Gordon Street, London, W.C.1* (Stand 155), will show examples of their new Porosint porous-metal leading-edge

Electronic timer unit by Rotax for pulsating-rubber-overshoe de-icing.



panel-type distributors for the exudation of de-icing fluid.

Teddington Controls, Ltd., Cefn Coed, near Merthyr Tydfil, South Wales (Stand 86), will display time and cycling switches which are particularly applicable to cyclic de-icing systems, and in which a timing accuracy is maintained at over 98 per cent throughout all permissible voltage variations. The company's well-known inching controls also lend themselves very well to de-icing applications. Additionally included on the stand will be the new range of hot-air valves which are capable of operating at the high temperatures and pressures met with in modern aircraft heating systems.

ELECTRIC ACTUATION

The British-Thomson Houston Co., Ltd., Rugby (Stand 49), produce an enormous range of electrical equipment, a great deal of it especially for aircraft. On the company's stand will be seen aircraft magnetoes, booster coils, A.C. and D.C. motors, generators, actuators, switches, circuit breakers, electronic voltage regulators, turbo-starters, Mazda lamps and lighting equipment.

Delco-Remy-Hyatt, Ltd., 111, *Grosvenor Road, London, S.W.1* (Stand 27), will have on view their range of fractional-horsepower motors in four basic frame-sizes, from 2¼in to 4in diameter. These units are available as series, shunt or compound types. In the same frame sizes, the company have also developed a range of split-field motors for electronic control, for follower devices, remote control systems, automatic radio compasses, etc.

The English Electric Co., Ltd., Queens House, Kingsway, London, W.C.2 (Stands G, 32), will exemplify their range of aircraft electrical equipment with a display of rotary and linear actuators, gear drives, and A.C. and D.C. motors, alternators and generators.

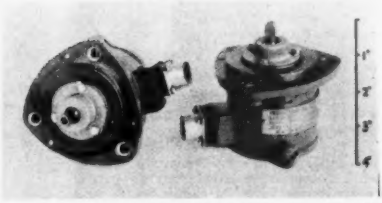
Marston Excelsior, Ltd., Fordhouses, Wolverhampton (Stand 142), are large suppliers of radomes and other articles fabricated in dielectric materials, and a typical nose radome will be exhibited on the stand.

Newton Brothers (*Derby*), *Ltd., Alfreton Road, Derby* (Stand 105), will display typical examples of their light-weight electrical equipment, including automatic carbon-pile voltage regulators, rotary transformers and convertors, aircraft generators, and so forth. Among special applications which will be on show will be Velodyne motor generators; a small motor complete with blower which, for a weight of but 7½ oz, has an output of 20 cu ft/min; and a small inductor-type alternator for 1,000 cyc/sec at 80 volts.

The Plessey Co., Ltd., Ilford, Essex (Stand 113), are to exhibit examples of their wide range both of linear and rotary actuators, including the Panther, Cub Cougar, Cougar, Cub Puma and Cheetah. In addition to these will be turbine and cartridge starters, fractional-horsepower motors, a selection of wiring accessories, pre-formed wiring and the latest developments in plugs and sockets. Included in the wiring accessories is a heavy-duty connector, a heavy-duty ground connector, and a junction-box specially designed for the Meteor. Available in 24-volt or 120-volt versions, the connector has a continuous current rating of 350 amp, and will carry a peak load of 1,500 amp.

Rotax, Ltd., Willesden Junction, London, N.W.10 (Stand 134), have, during the last twelve months, designed, developed and manufactured all forms of actuators for the

larger aircraft types, and many of these actuators will be displayed on the stand. One of the main achievements of the company during the past year has been the development of complete 112-volt electrical systems for aircraft, which has included the development of 112-volt D.C. generators of 15 kW capacity, together with all forms of actuation, protection and switch gear associated with such installations. A new control switch has been developed for electrical starters for gas turbines, together with double and single high-energy ignition units designed to assist in the re-lighting of gas turbines at high altitudes. In addition the company manufacture a well-known range of turbo-starters.



Newton inductor-type alternator for 1,000 cyc/sec at 80 volts.

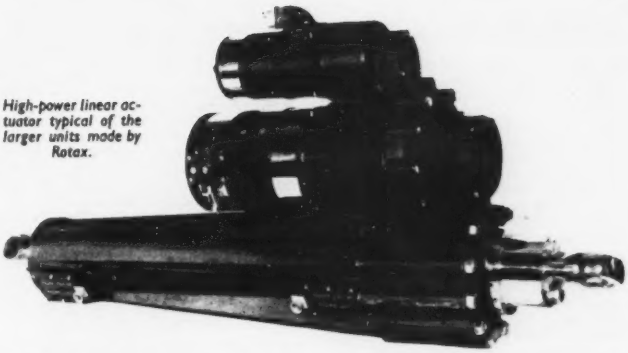
Salford Electrical Instruments, Ltd., Silk Street, Salford 3, *Manchester* (Stand 17), have developed the Rotasol, an ingenious electro-magnetic unit capable of producing high torque throughout a limited angular travel. It is especially suitable for such work as step-driving multiple gangs of circuit switches.

Teddington Controls, Ltd., Cefn Coed, near Merthyr Tydfil, South Wales (Stand 86), continue to manufacture their well-known range of inching controls, electro-hydraulic and magnetic valves, electro-magnetic jacks, solenoid-operated valves, time switches and pressure switches, etc. A section of the display will show the new range of Teddington gate-valves, variants of which will be displayed for use in air and fuel systems, and include the new range of hot-air valves for operation at the high temperatures and pressures common in aircraft heating systems.

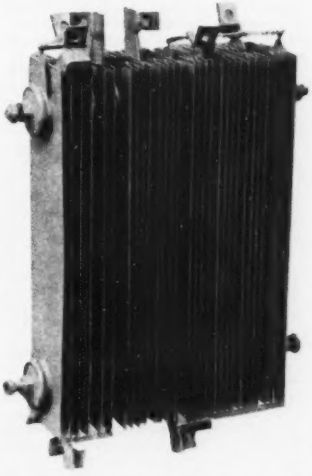
*Ultra Electric, Ltd., Western Avenue, London, W.*3 (Stand 150), will show a gas-turbine temperature-control system, for limiting the maximum temperature of the jet pipe or, alternatively, for controlling the temperature automatically to a variable selected datum. In addition, the company will exhibit a composite control system developed for use with the Bristol Proteus. The system provides remote positioning of the throttle valve and governing of compressor speed to close limits at any selected figure. A temperature-limiter to reduce fuel-flow is also incorporated, together with an overriding position control for use in the event of power failure in the normal system.

Western Manufacturing Estate, Ltd., The Aerodrome, Reading, Berks (Stand 70), are designers and manufacturers of electrical actuators, trim switches, motors, indicators, etc., and will be showing examples of their range from the small unit with a nominal operating rate of 25 lb for a weight of 16 oz up to that with an operating rate of 3,000 lb for a weight of 18 lb. The Type SS 125 Mk 9 electric motor measures but 2¼in by 2¼in yet has a power output of 0.1 h.p. at 10,000 r.p.m.

*Westinghouse Brake and Signal Co., Ltd., 82, York Way, King's Cross, London, N.*1 (Stand 140), will show examples of their light-weight "Westalite" rectifier units, in conjunction with many of the proprietary power units with which they are used. A separate rectifier assembly indicates the convenient simplicity of these selenium-compound units which, with the benefit of forced air cooling, offer a weight/capacity ratio of under 3 lb/kW.



High-power linear actuator typical of the larger units made by Rotax.



Typical Westinghouse Westolite forced-air-cooled rectifier of particularly light weight.

EMERGENCY EQUIPMENT

P. Frankenstein and Sons (Manchester), Ltd., Victoria Rubber Works, Newton Heath, Manchester 10 (Stand 161), will be displaying their civilian type inflatable life-saving jacket as supplied to B.O.A.C. and B.E.A.; the latest-type inflatable life jacket for Service aircrew; and inflatable exposure-suit; Mk VI constant-wear immersion suit; a light-weight flying overall; inflatable life-jackets for naval aviation; and a new inflatable stretcher for ambulance aircraft.

G.Q. Parachute Co., Ltd., Stadium Works, Woking, Surrey (Stand 1), are showing, as representative of their range of escape-type parachutes, the Mk 3 version for use with the Martin-Baker ejector seat. In addition, 25g Z-type safety harness will be on view, together with displays of braking and anti-spin tail chutes, paratroop equipment (including the X-type Statichute) and representative types of supply-dropping equipment.

Integral, Ltd., Cousins Street, Wolverhampton (Stand 53), manufacture hydraulically-actuated shears for emergency entry into crashed aircraft. A light version is for continuous cutting round a section of aircraft skin, whilst the heavier type can deal with structural sections.

Irving Air Chute of Great Britain, Ltd., Letchworth, Herts (Stand 35), are to display a variety of their approved parachutes for Service use, including pilot-seat, observer-chest, back, and back light-weight types, together with those designed for gliders, and for the Attacker and Canberra. Irving approved paratroop chutes and supply-dropping parachutes will also be shown, together with the company's automatic barometric opening device.

M. L. Aviation Co., Ltd., White Waltham, Maidenhead, Berks (Stand 71), will include in their display a special Very-pistol mounting, whereby the pistol can be fired and re-loaded from the interior of a pressure cabin without loss of pressurization or discharge into the cabin of noxious fumes. Another development is a harness release which is thinner than usual and incorporates a push-button that rises when unlocked and so gives a tactile as well as a visual indication of its condition.

Martin-Baker Aircraft, Ltd., Higher Denham, Middlesex (Stand S), will show the latest version of the company's famous ejector seat. This latest design is fully automatic in action, and is claimed to be effective at any speed and under any accelerations that may be encountered, irrespective of aircraft attitude. The seat features combined parachute and seat harness, and a barostat is incorporated with the timing device so that the locks are not freed until the seat has fallen to a safe (breathable atmosphere) altitude. (A special drawing appears on page 320).

R.F.D. Co., Ltd., Catteshall Lane, Godalming, Surrey (Stand 114), will have one of the more unusual stands, in that a representation is given of a cut-away furnished fuselage, through one of the "windows" of which continuous-sequence films will be shown to illustrate the products of the company in action; these products include a range of inflatable dinghies and life-jackets, and first-aid and signalling equipment.

The Schermuly Pistol Rocket Apparatus, Ltd., Spra Works, Newdigate, Surrey (Stand 60), will be showing a wide range of their pyrotechnic equipment, which includes ground-to-air control flares

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of up to one million candlepower, aircraft emergency landing flares of up to 400,000 c.p., ground-flare landing units of 150,000 c.p., search and rescue flare units, high-altitude parachute signals, dinghy distress signals, smoke-flame floats, and Very pistols and cartridges. One of the more recent developments by the company is the H.T.V. smoke-flame float; this has an exceptionally high dropping rate, and automatic ignition on impact with the water.

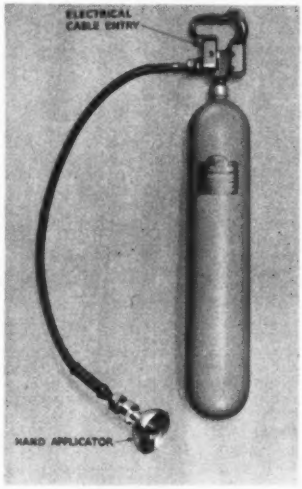
Siebe Gorman and Co., Ltd., Davis Road, Tolworth, Surbiton, Surrey (Stand 110), will display safety harness, both for military and civil aircraft, and life-saving waistcoats (flotation jackets), to the company's own and to B.O.A.C. designs.

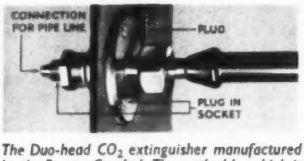
FIRE PREVENTION

The Graviner Manufacturing Co., Ltd., Poyle Mill Works, Colnbrook, Bucks (Stand 146), will display the new production version of the magnetic type re-setting fire detector, and this will be complemented by a new type continuous re-settng detector. Each of these exhibits will be featured against a background of the fire-prevention equipment for which the company are world-famous.

Pye, Ltd., Cambridge (Stand 167), well known as makers of radio equipment and electrical test apparatus, have developed impact switches to give protection against fire hazards.

The Pyrene Co., Ltd., Grosvenor Gardens, London, S.W.1 (Stand 98), will exemplify their range of fire-fighting appliances by the Duo-head CO_2 extinguisher. This can be used either as a portable hand extinguisher or as an automatically-operated unit, particularly in conjunction with the company's smoke detector, which is specially designed to give warning of an outbreak of fire in baggage compartments or inaccessible parts of the aircraft when grounded or in flight. Other Pyrene fire appliances comprise pressure-type hand extinguishers using methyl-bromide or C.B. mixture, the PA 33 "wet" water extinguisher, and the range of extinguishing equipment for airfield use.





The Duo-head CO_2 extinguisher manufactured by the Pyrene Co., Ltd. The method by which it can be coupled to a piping installation is shown.

Venner Time Switches, Ltd., Kingston By-Pass Road, New Malden, Surrey (Stand 78), will have on view their delay-action switch for use with methyl-bromide spray engine-fire extinguishing systems. The switch ensures that, whether the engine has come to rest or not, it is flooded automatically after the delay period.

FUEL COMPONENTS

Automotive Products Co., Ltd., Tachbrook Road, Leamington Spa (Stand 81), will exhibit Lockheed-Avery hoses and self-sealing couplings in a complete range of types and sizes, including examples of the standard S.B.A.C. pressure-refuelling coupling. The well-known Purolator fuel and oil filters for aircraft will also be on view.

Delaney Gallay, Ltd., Vulcan Works, Edgware Road, London, N.W.2 (Stand 121), in addition to their work in the heat-exchanger field, also manufacture specialized fuel tanks in a variety of light alloys.

Dowty Equipment, Ltd., Arle Court, Cheltenham, Glos (Stand 9), are to include in their diverse display a gas-turbine fuel pump and items of fuel system equipment, including sectioned spill burners.

The Fairey Aviation Co., Ltd., Hayes, Middlesex (Stands E and 44), will have on view the Fairey filler cap (pressure type) which is tested for a maximum pressure of 20 lb/sq in; the unit is proof against continuous vibration shock-loads. Complementing the filler cap is a fuel drain valve applicable to all types of tank drainage systems. Simple in design and designed to withstand pressurization, the unit is installed on many modern aircraft. Nut rings in a variety of sizes will, additionally, be shown.

Fireproof Tanks, Ltd., The Airport, Portsmouth, Hants (Stand 159), will exhibit typical examples of their range of flexible fuel tanks, together with new grades of tank sheeting-materials. Tank fittings, synthetic rubber mouldings, flame-proof and crash-proof coverings, synthetic rubber sealing rings and vibration damper blocks will also be shown. Information will be available on a new method, evolved to meet special requirements, of supporting flexible tanks.

H. M. Hobson, Ltd., Fordhouses, Wolverhampton (Stand 55), intend to exhibit injection and float-type carburettors, fuel injection pumps and a representative selection of their accessories for use with gas-turbine power installations.

Joseph Lucas (Gas Turbine Equipment), Ltd., Willesden Junction, London, N.W.10 (Stand 133), design, develop and manufacture complete gas-turbine fuel systems as well as the individual units, such as pumps, barometric pressure controls, air-fuel ratio controls, burners, valves and so forth which are included in the systems.

Marston Excelsior, Ltd., Fordhouses, Wolverhampton (Stand 142), are to exhibit a light-weight flexible bag-tank, especially made to include the new "pad" fittings and to illustrate the various methods of attachment applicable to this type of tank. Examples of moulded outlet connections now common on Flexelite tanks will also be shown. The new pad fitting attachment permits a pre-determined amount of compression to be applied when the fittting is secured, and the pad is so shaped as effectively to resist side movement.

Upstream-flow burner developed by Rotax.

The Palmer Tyre, Ltd., Penfold Street, Edgware Road, London, N.W.8 (Stand 41), are to exhibit their Silvoflex pipes which, designed to withstand persistent flexing, and embracing resistance to oil, petrol, extreme variations of temperatures and pressures, are in wide use.

Vickers-Armstrongs, Ltd., Vickers House, Broadway, Westminster, London, S.W.1 (Stand L), will include in their display working models of their well-known R-type and P-type cocks fitted with actuators of Plessey, English Electric and Western manufacture. A non-return valve and a 3in jettison-valve with Rotax actuator will also be shown.

Vokes, Ltd., Henley Park, Guildford, Surrey (Stand 25), will include, among the representative units of their filtration range for various fluids, some of their latest designs for oil and fuel systems.

HYDRAULIC EQUIPMENT, POWERED CONTROLS AND UNDERCARRIAGES

Automotive Products Co., Ltd., Tachbrook Road, Leamington Spa (Stand 81), will feature a working model of the Servodyne power assistance system for flying controls. Standard units from the Lockheed hydraulic power service for aircraft, such as the Mk 7 pump and a new type cut-out valve, will be shown in conjunction with examples of Lockheed undercarriages and retracting gear. A new development by the company is a hydraulic brake for reducing the "run-down" time for gas turbines.

Boulton Paul Aircraft, Ltd., Wolverhampton (Stand P), will include on their stand units of the high-fidelity electro-hydraulic power control system the company have developed.

British Messier, Ltd., Cheltenham Road East, Gloucester (Stand 138), will exhibit two large units in the shape of the main bogie undercarriage (less wheels) for a new bomber, and a smaller display for the Bristol 175 airliner. A sectioned model of the Westinghouse Decelostat (in which British Messier have collaborated) will also be shown, together with Perspex dynamic models of the pump, hydraulic motor, and electro-selector of the company's 4,000 lb/sq in hydraulic system.

Dowty Equipment, Ltd., Arle Court, Cheltenham (Stand 9), *Dowty Equipment of Canada, Ltd.* (Stand 8) and *Dowty Seals, Ltd.* (Stand 7), are jointly to exhibit a representative selection of their manifold interests. The units on show will include nose and main undercarriage items for the Sea Hawk, Meteor N.F. 11 and Canberra;

the company's new Vardel high-pressure variable-delivery hydraulic pump; the new Hydel four-way electro-hydraulic selector valve; a selection of retraction units for the Brabazon, Shackleton, Canberra and Sea Hawk; a Canberra flap jack; Sea Hawk dive-recovery flap jack; and a combined tailwheel retraction jack and shock-absorber unit. A display board will illustrate typical examples of the several forms of seals in which Dowty Seals specialize, together with the new Strud rubber/metal bonded bolt.

Dunlop Rubber Co., Ltd., Aviation Division, Holbrook Lane, Foleshill, Coventry (Stand 40), will show their Mk 3 hydraulic brake-control valve, both in the differential and foot-linkage versions. The Maxaret automatic brake control for the prevention of skidding and maintenance of optimum braking effort will be on view, together with examples of the company's Maxivue windscreen wiper, the plate-type wheel brake and an assorted assembly of tyres.

Electro-Hydraulics, Ltd., Liverpool Road, Warrington, Lancs (Stand 36), will be showing part of a nose undercarriage swivel housing; a demonstration model of a jack lock; a booster pump; and a selection of sectioned valve units. These items will be typical of the wide range the company manufacture. A set of jacks for the Swift are also to be displayed.

Exactor, Ltd., 108, *Park Street, London, W.*1 (Stand 56), are to display examples of the well-known Exactor hydraulic remote control which is suitable not only for engine applications, but also for auxiliary services such as landing lamps, cooler shutters, radar and so forth.

The Fairey Aviation Co., Ltd., Hayes, Middlesex (Stands E and 44), will exhibit the latest form of hook damper for installation in deck-landing aircraft, and the now-famous Hydro-booster which the company claim to be the simplest and most reliable power control unit available. This system is fitted to new military and civil aircraft, including the Avro Canada CF-100 and Jetliner. A general selection of the company's hydraulic components, including undercarriage shock absorber units control valves, jacks and so forth, complete the display.

Girling, Ltd., Tyseley, Birmingham (Stand 120), will show, among examples of their hydraulic brakes for light- and medium-weight aircraft, the two leading-shoe self-adjusting Hydrastatic brake, which employs very small master cylinders.

Goodyear Tyre and Rubber Co. (Great Britain), Ltd., Wolverhampton (Stand 163), will include on their stand the famous Goodyear Trophy for which light-aircraft contestants race each year. Together with this prize will be shown a range of aircraft tyres; photographs illustrating the cross-wind landing gear as fitted to Auster and Skyjeep; and a wheel and brake assembly for one of the latest fighters.

H. M. Hobson, Ltd., Fordhouses, Wolverhampton (Stand 55), are manufacturers of powered flying control components, both of piston and screwjack type. In each variation, hydraulic or electro-hydraulic means of actuation are available.

Integral, Ltd., Cousins Street, Wolverhampton (Stand 53), will have on view selected items from their range of precision-made hydraulic pumps for system pressures up to 4,000 lb/sq in. A working demonstration of a 13-14 h.p. hydraulic motor will also be arranged, showing application of the unit (which is now in production) to the hoist gear of helicopters; in conjunction with an appropriate pump, this motor is also used in the Hobson power flying control system.

Typical of their high-quality work is this pressure gauge by Sangamo Weston.

Re-designed controller unit for the latest Smith S.E.P.2 electric auto-pilot.

In addition to the foregoing, a range of electric motor pump units, sequence valves, control valves, automatic cut-outs and relief valves, some of which are cleverly sectioned, will be on view.

*The Palmer Tyre, Ltd., Penfold Street, Edgware Road, London, N.W.*8 (Stand 41), will display examples of smooth, ribbed, patterned and twin-contact tread tyres, with casings plied both with rayon and nylon cord. In conjunction with these will be wheels of the latest split, detachable-flange and solid types. A further item of topical interest is the Palmer tyre, wheel and brake assembly for the new Percival Provost. Although the brake in this assembly is of expander-tube type, other brakes shown on the stand are of disc and mechanically-operated pattern, the latter in particular being in demand for light aircraft, helicopters and gliders.

INSTRUMENTS

Kelvin and Hughes (Aviation), Ltd., New North Road, Barkingside, Essex (Stand 12), intend to exemplify their range of aircraft instruments by exhibiting a wrist-type altimeter and a cabin altimeter; a cowl-fitting A.S.I. for deck-landing aircraft; a low-range A.S.I. for gliders and helicopters, etc.; a miniature tachometer; a lightweight generator; a sensitive pressure gauge; a rate-of-climb indicator; a synchroscope; a Mark XII turn-and-slip indicator; the new GM 2F compass, which is a development of the well-known GM Mk III unit for fighters; a type IA periscopic sextant; the new miniature E2A stand-by compass; a P.12 bowl compass; and a Mk 20 drift-sight.

Salford Electrical Instruments, Ltd., Silk Street, Salford 3, *Manchester* (Stand 17), will display a radio altimeter for the indication of instantaneous height above terrain; a selection of quartz-crystal units; link-testing instruments, and radio-sonde meteorological telemetering airborne and ground equipment.

Sangamo Weston, Ltd., Enfield, Middlesex (Stand 61), will be showing a full range of the electrical measuring instruments for which the company are renowned, including those for use with navigational systems, electrical power indicators, and temperature and movement measurement. Relays, thermocouples, thermometer bulbs and oil-pressure transmitters will also be shown, together with their associated indicators. In addition, ground test sets and a representative range of instruments for laboratory and workshop use will be on view.

Simmonds Aerocessories, Ltd., Treforest, Glamorgan (Stand 137), are to show a working model of the Pacitor Electronic fuel-contents gauge, the well-established system which provides accurate measurement irrespective of aircraft attitude. To complement this display the latest Type II version of the system will be shown for the first time; among other advantages, it achieves a considerable weight saving over earlier models.

*Smiths Aircraft Instruments, Ltd., Cricklewood, London, N.W.*2 (Stand 13), manufacture an enormous range of instruments and associated equipment, and the display of units on the company's stand will emphasize this fact. Of the new developments, chief interest attaches to a graded-scale rate of climb indicator (with an anodized aluminium case) whereby errors due to rapid temperature change are reduced; an inductor-type pressure-gauge system; a selection of Aysynns and small motors; balancer relays; and the latest version of the company's famous electric auto-pilot, the S.E.P.2, which features reduced weight, additional flexibility of circuits and a barometric height lock together with an improved-design controller.

Sperry Gyroscope Co., Ltd., Great West Road, Brentford, Middlesex (Stand 106), will introduce two new instruments in their display, the H.L.6 electric gyro-horizon and the C.L.3 Gyrosyn compass. In addition, a special exhibit will illustrate the basic principles of flight control using the Zero Reader. Other items will include a flight instrument panel layout agreed by B.O.A.C. and B.E.A. for the Comet, Viscount and future aircraft; the latest type A.L. IA light weight auto-pilot; and a selection of photographs illustrating the wide scale on which Sperry instruments have been adopted in post-war aircraft.

PNEUMATICS

The British-Thomson Houston Co., Ltd., Rugby (Stand 49), among the diversity of other components they produce, also manufacture the Type H leak-detector for use with aircraft pneumatic systems. This instrument is capable of detecting a leak passing air at a low rate which would be undetectable by the usual methods.

Dunlop Rubber Co., Ltd., Aviation Division, Holbrook Lane, Foleshill, Coventry (Stand 40), doyen among pneumatic specialists, represent their great range of components by a Mk I three-stage 3,300 lb/sq in compressor, which is especially suitable for jet aircraft. Other recent developments by the company are a steel spherical air-storage bottle for use with high-pressure systems, and variants in the range of Electromatic valves and reducing valves.

Electro-Hydraulics, Ltd., Liverpool Road, Warrington, Lancs (Stand 36), to complement their work in the hydraulic field, also design and manufacture complete pneumatic systems and pneumatic and electro-pneumatic components.

Hymatic Engineering Co., Ltd., Redditch, Worcs (Stand 97), now have in quantity production their S.50.U. compressor for 1,000 lb/sq in systems, and have also

AUXILIARY SERVICES . . .

introduced a range of reducing valves for large air-flow tapped from gas turbines. The company have, additionally, developed a lightweight reducing-valve which has particular application to auto-pilots, and will be exhibiting a pair of special valves which have been designed for fuel feed systems.

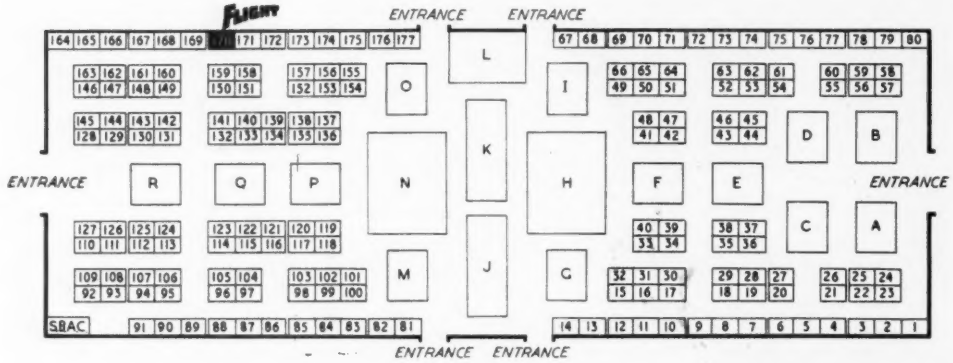
The Palmer Tyre, Ltd., Penfold Street, Edgware Road, London, N.W.8 (Stand 41), in addition to their wide interests in the wheel, tyre and brake fields, also manufacture a considerable range of pneumatic valves, rams and differential controls.

Vickers-Armstrongs, Ltd., Vickers House, Broadway, Westminster, London, S.W.1 (Stand L), include in their range of aircraft accessories a variety of cocks and valves, of which the ¼in B.S.P. non-return valve for use with air at temperatures up to 150 deg C, and the air governor valve for controlling the pressure drop across the jets of air-driven instruments in pressure cabins are well representative of the pneumatic units.

The Ministries' Contribution

BOTH the Ministry of Supply and the Ministry of Civil Aviation are to have important exhibits at Farnborough. On stand O the M.o.S. will have representative examples of its activities—plastic structures, a transonic research exhibit, H.F. suppressed-aerial systems, an experimental bi-fuel rocket, and others. The M.C.A. (Stand I) will show its impressive 14ft x 8ft model of London Airport, together with instructive photographs, and diagrams of air-traffic-control systems.

FLOOR PLAN OF THE STATIC SHOW AND LIST OF EXHIBITORS



AIRCRAFT MANUFACTURERS

	Stand
Alvis, Ltd.	R
Auster Aircraft, Ltd.	128
Blackburn and General Aircraft, Ltd.	K
Boulton Paul Aircraft, Ltd.	P
Bristol Aeroplane Co., Ltd.	J
De Havilland Enterprise, The	H
English Electric Co., Ltd.	G, 32
Fairey Aviation Co., Ltd.	E, 44
Handley Page, Ltd.	D
Hawker Siddeley Group, The	N
Martin-Baker Aircraft, Ltd.	S
Ministry of Supply	O
Ministry of Civil Aviation	I
D. Napier and Son, Ltd.	A
Percival Aircraft, Ltd.	M
Rolls-Royce, Ltd.	B
Saunders-Roe, Ltd.	127
Scottish Aviation, Ltd.	C
Short Bros. and Harland, Ltd.	L
Vickers-Armstrongs, Ltd.	F
Westland Aircraft, Ltd.	

MATERIALS, COMPONENTS, ACCESSORIES, ETC.

	Stand
Airscrew Co., Ltd., The	28
Accles and Pollock, Ltd.	63
Acton Bolt, Ltd.	90
Aerolex, Ltd.	69
Aeronautics	147
The Aeroplane	111
Aircraft Engineering	22
Aircraft Production	170
Aircraft Materials, Ltd.	52
Air Trainers, Ltd.	117
Airwork, Ltd.	99
Amal, Ltd.	149
Anglo-Iranian Oil Co., Ltd.	93
B. Attewell and Sons, Ltd.	166
Automotive Products, Ltd.	81
Aviation Developments, Ltd.	169
Avica Equipment, Ltd.	95
Birmetals, Ltd.	68
Birmingham Aluminium Casting (1903), Ltd.	58
Thomas Boorn and Co., Ltd.	20
James Booth and Co., Ltd.	132
R. A. Brand and Co., Ltd.	107
British Aluminium Co., Ltd.	109
British Ermeto Corporation, Ltd.	144
British Insulated Callender's Cables, Ltd.	50
British Messier, Ltd.	138
British Thomson-Houston Co., Ltd.	49
British Wire Products, Ltd.	5
David Brown (Huddersfield), Ltd.	158
Brown Bros. (Aircraft), Ltd.	37
Bryans Aeroquipment, Ltd.	51
Callon, Ltd.	101
Chloride Batteries, Ltd.	104
E. K. Cole, Ltd.	21
Connolly Bros. (Curriers), Ltd.	64
Coopers Mechanical Joints, Ltd.	74
Cossor Radar, Ltd.	84
John Curran, Ltd.	139
D. A. Daniel and Co., Ltd.	4
Decca Navigator Co., Ltd.	65
Delaney-Gallay, Ltd.	121
Delco-Remy and Hyatt, Ltd.	27
Desoutter Bros., Ltd.	82
Docker Bros., Ltd.	30
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Dowty Equipment of Canada, Ltd.	8
Dowty Seals, Ltd.	7
Dunlop Rubber Co., Ltd.	40
E.N.V. Engineering Co., Ltd.	116
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English Steel Corporation, Ltd.	102
H. J. Enthoven and Sons, Ltd.	94
Esso Petroleum Co., Ltd.	88
Exactor, Ltd.	56
Export Packing Service, Ltd.	162
Ferranti, Ltd.	15
Fibreglass, Ltd.	143
Fireproof Tanks, Ltd.	159
Firestone Tyre and Rubber Co., Ltd.	151
Thos. Firth and John Brown, Ltd.	39
T. F. Firth and Sons, Ltd.	10
Firth Vickers Stainless Steels, Ltd.	145
W. T. Flather, Ltd.	118
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G.Q. Parachute Co., Ltd.	1
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Guest, Keen and Nettlefolds (Midlands), Ltd.	47
J. J. Habershon and Sons, Ltd.	42
Hairlok Co., Ltd.	6
Hall and Hall, Ltd.	87
Hall and Pickles, Ltd.	175
John Hall and Sons (Bristol and London), Ltd.	67
Harley Landing Lamps, Ltd.	89
High Duty Alloys, Ltd.	119
H. M. Hobson (Aircraft and Motor) Components, Ltd.	55
Hordern-Richmond, Ltd.	126
Hughes Johnson Stampings, Ltd.	75
Hymatic Engineering Co., Ltd.	97
I.C.I., Ltd. (Paints Division)	160
I.C.I., Ltd. (Plastics Division)	148
Integral, Ltd.	53
Irving Air Chute of Great Britain, Ltd.	35
Jablo Propellers, Ltd.	54
Jenolite, Ltd.	85
Wm. Jessopp and Sons, Ltd.	125
K.L.G. Sparking Plugs, Ltd.	11
Kelvin and Hughes (Aviation), Ltd.	12
King Aircraft Corporation	152
Lancefield Coachworks	73
Latex Upholstery, Ltd.	3
Lep Transport, Ltd.	46
Lodge Plugs, Ltd.	33
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Magnesium Elektron, Ltd.	29
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Marston Excelsior, Ltd.	142
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Mond Nickel Co., Ltd.	122
Murex Welding Processes, Ltd.	83
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Newton Bros. (Derby), Ltd.	105
Normalair, Ltd.	172
Northern Aluminium Co., Ltd.	80
Oldham and Son, Ltd.	171
Palmer Tyre, Ltd.	41
R. and J. Park, Ltd.	2
Pato and Radford, Ltd.	123
Plessey Co., Ltd., The	113
Plessey International, Ltd.	112
Pressed Steel Co., Ltd.	115
Precision Rubbers, Ltd.	168
Pye, Ltd.	167
Pyrene Co., Ltd.	98
R.F.D. Co., Ltd.	114
Radifon, Ltd.	130
Ranfrew Foundries, Ltd.	19
Reynolds Tube Co., Ltd.	16
Rotax, Ltd.	134
Rotol, Ltd.	76
Rubery, Owen and Co., Ltd.	177
Llewellyn Ryland, Ltd.	43
Salford Electrical Instruments, Ltd.	17
Sangamo Weston, Ltd.	61
Joseph Sankey and Sons, Ltd.	157
Saunders Valve Co., Ltd.	165
Savage and Parsons, Ltd.	34
Schermuly Pistol Rocket Apparatus, Ltd.	60
Self-Priming Pump and Engineering Co., Ltd.	141
Shell-Mex and B.P., Ltd.	92
Siebe Gorman and Co., Ltd.	110
Silentbloc, Ltd.	59
Simmonds Aerocessories, Ltd.	137
Skyhi, Ltd.	124
Smiths Aircraft Instruments, Ltd.	13
Smiths Stamping Works (Coventry), Ltd.	129
Southern Forge, Ltd.	18
Sperry Gyroscope Co., Ltd.	106
Standard Telephones and Cables, Ltd.	136
Sterling Metals, Ltd.	23
J. Stone and Co. (Charlton), Ltd.	24
Suntex Safety Glass Industries, Ltd.	156
T.I. Aluminium, Ltd.	31
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Tecalemit, Ltd.	131
Teddington Controls, Ltd.	86
Telaflex Products, Ltd.	103
Thermo-Plastics, Ltd.	77
Tiltman Langley Laboratories, Ltd.	108
Titanine, Ltd.	154
Triplex Safety Glass Co., Ltd.	26
Tubes, Ltd.	96
Tufnol, Ltd.	66
Tungum Sales Co., Ltd.	135
Ultra Electric Co., Ltd.	150
Venner Accumulators, Ltd.	79
Venner Time Switches, Ltd.	78
Vokes, Ltd.	25
Waymouth Gauges and Instruments, Ltd.	14
Wellworthy Piston Rings, Ltd.	72
Western Manufacturing Estate, Ltd.	70
Westinghouse Brake and Signal Co., Ltd.	140
Henry Wiggin and Co., Ltd.	173
Williamson Manufacturing Co., Ltd.	57
John Wright and Sons (Veneers), Ltd.	91

ROTOL *at Farnborough*

11-16th SEPTEMBER
STAND No. 76

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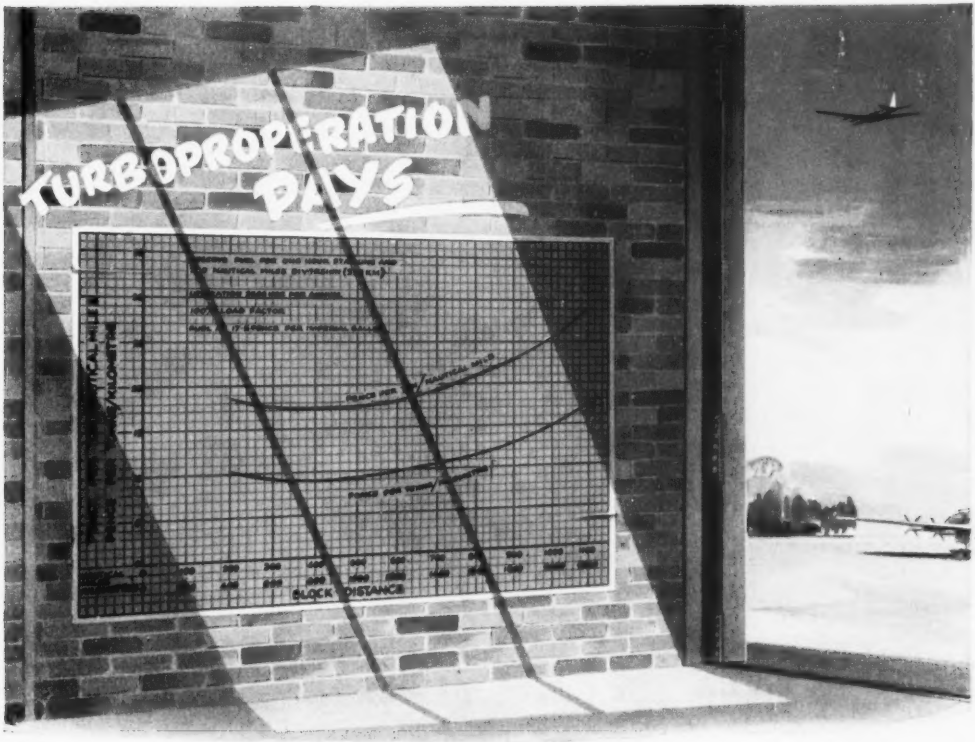
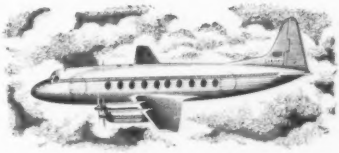


A.T.147

The Writing on the Hangar Wall

The Viscount revolutionises air travel as completely as travel by road was changed by the pneumatic tyre. The design of the aircraft and the smooth running of the Dart turboprops bring exceptional freedom from major and minor unserviceability. The lay-out, too, is designed for the quickest possible turn-round. The result is great economy—the figures speak for themselves—and a high utilisation factor. Equally important, the Viscount's quietness and comfort establish a high degree of prestige and goodwill with the passengers.



VICKERS VISCOUNT

(B.E.A. Discovery Class)

Four Rolls-Royce Dart Propeller Turbine Engines

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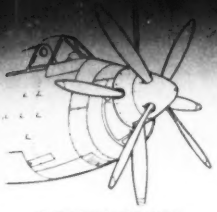
The FAIREY

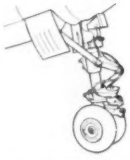
TWIN-ENGINED · ANTI-SUBMARINE

(ARMSTRONG SIDDELEY 'DOUBLE MAMBA')

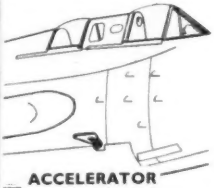


CONTRA-PROPS

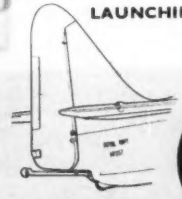
PILOT'S VIEW



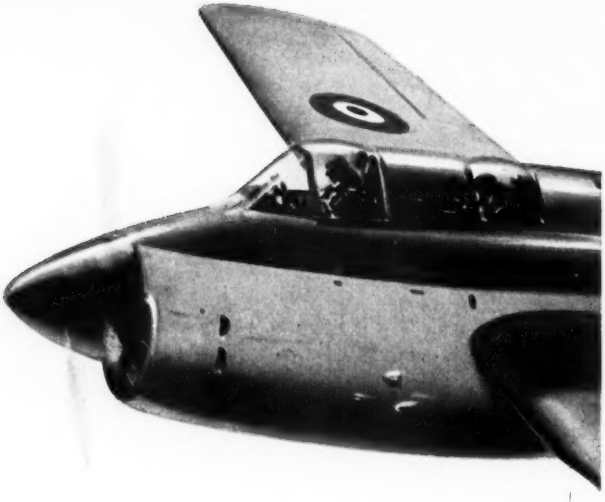
NOSE WHEEL U/C



ACCELERATOR LAUNCHING



STING HOOK



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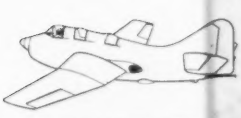
GANNET

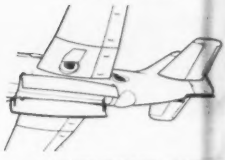
CARRIER - OPERATED

DOUBLE MAMBA'

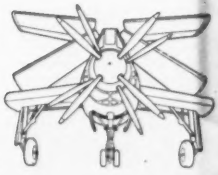
SCANNER



EXHAUST AFT
OF COCKPITS



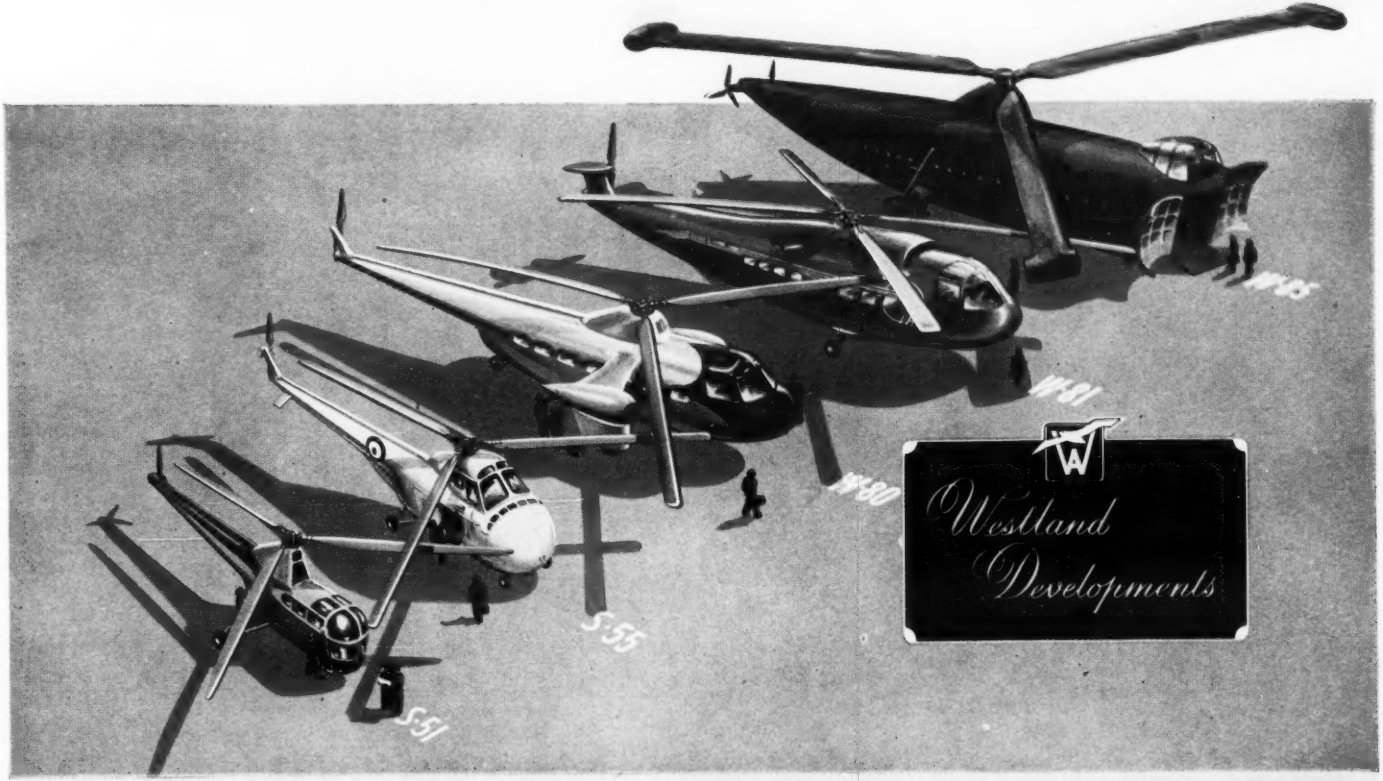
LARGE BOMB BAY



WING FOLDING

in the ROYAL NAVY

HAYES, MIDDLESEX, ENGLAND



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Proof of the utterly dependable performance of world-famous Lodge Plugs is in the impressive number of major airlines—over 21 well-known companies—who fit Lodge. Lodge Plugs are also fitted by the makers of these famous engines—Alvis, Armstrong-Siddeley, Bristol, De Havilland, Rolls-Royce—and are supplied to the Governments of many countries.

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STAND 33
S.B.A.C. Exhibition

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THE ANCILLARY INDUSTRY

IN the following pages are summaries of the principal products of nearly 400 British firms contributing directly and indirectly to the construction, maintenance and operation of civil and military aircraft. This section of the "Britain's Aviation Industry" Number of *Flight* should be regarded as supplementary to the preceding six pages, where, under the heading of "Auxiliary Services," major aircraft installations appearing at the S.B.A.C. "Static" Show, such as airscrews and hydraulic systems, are reviewed. Unless they happen to market components, etc., as well, constructors of complete aircraft and engines are not included in the directory in the following pages; for data on these products readers are referred to the main reviews elsewhere in this issue. In the following directory, ancillary materials and products are reviewed, broadly classified under twelve main headings. In certain cases the work of an individual firm may fall under two or more headings, in which circumstances a cross-reference is made. Where firms are exhibiting at the S.B.A.C. "Static" Show, stand numbers are given at the end of the applicable paragraphs.

MATERIALS

(Including Metals, Castings and Forgings, etc.; Wood and Plastics, excluding Finished Parts)

ACCLES AND POLLOCK, LTD., Oldbury, near Birmingham (Broadwell 1500, Telex Broadwell 1797).—Manufacturers of seamless steel tube, stainless-steel and steel-alloy tubes; A.G.S. rivets; tubular box spanners and wrenches; built-up structures; machined tubes for oleo gear. **S.B.A.C. Stand 63.**

ACTON BOLT LTD., Chase Road, London, N.W.10 (Elgar 5775).—Bolts of all types in high-tensile materials, produced for every purpose and scientifically manufactured to fine limits. **S.B.A.C. Stand 90.**

AERO RESEARCH, LTD., Duxford, Cambridge (Sawston 187).—Synthetic resin adhesives; "Redux" for metal-to-metal, wood, rubber, plastics and friction linings; "Araldite" for metals (also as a filler); "Aerolite" for wood structures.

AEROPLASTICS, LTD., Earl Haig Road, Hillington, Glasgow, S.W.2 (Halfway 1683).—Subsidiary of The Fairey Aviation, Co., Ltd. Aircraft components in laminated paper-base plastic material, to S.B.A.C. requirements.

AIRCRAFT MATERIALS, LTD., Midland Road, London, N.W.1 (Euston 6151).—Ferrous and non-ferrous alloys; fabrics, cordage, upholstery requirements and associated materials. See also under "Aircraft Parts" and "Factory and Airfield Equipment."

AIRSCREW COMPANY AND JICWOOD, LTD.—See under "Aircraft Parts."

ALMIN, LTD., Farnham Royal, Bucks (Farnham Common 594).—Parent company of Renfrew Foundries, Ltd., International Alloys, Ltd., Southern Forge, Ltd., etc.

ANDREWS TOLEDO, LTD., Toledo Works, Sheffield, 3 (Sheffield 23274).—Steels for the aircraft and other industries; wire rods, spring steels, high-speed alloy and carbon tool steels.

ANGUS AND CO., LTD., GEORGE.—See under "Aircraft Parts."

B.B. CHEMICAL CO., LTD., Ulverscroft Road, Leicester (Leicester 20175).—"Bostik" adhesives and sealing compounds for aircraft applications.

BAKELITE, LTD., 18, Grosvenor Gardens, London, S.W.1 (Sloane 9911).—Bakelite plastics, in mouldings, laminated sheet, rod and tube; synthetic resins; vinyl compounds.

BAMBERGERS, LTD., 27/28, Finsbury Square, London, E.C.2 (Monarch 4466).—Aircraft spruce, plywood, veneer, hardwood and softwood importers.

BIRMETALS, LTD., Woodgate Works, Quinton, Birmingham 32 (Woodgate 2253).—Sections, tubes and sheet in the recently developed Elektron magnesium zirconium alloys; also Birmabright and Birmetals aluminium alloys; Argon-arc-welded structures. **S.B.A.C. Stand 68.**

BIRMINGHAM ALUMINIUM CASTING (1903) CO., LTD., Birmid Works, Smethwick, Birmingham (Smethwick 1413).—Light-alloy castings (aluminium and magnesium-zinc base) by the sand, gravity and pressure processes. **S.B.A.C. Stand 58.**

BOORN AND CO., LTD., THOMAS.—See under "Aircraft Parts."

BOOTH AND CO., LTD., JAMES, Argyle Street Works, Nechells, Birmingham 7 (East 1521).—Extruded sections, tube, sheet, strip and forgings in aluminium alloys, brass and copper. **S.B.A.C. Stand 132.**

BRITISH ALUMINIUM CO., LTD., Salisbury House, London Wall, London, E.C.2 (Monarch 4432).—Aluminium and aluminium alloys for aircraft and other purposes in standard wrought forms; aluminium-alloy sheet and strip. **S.B.A.C. Stand 109.**

BRITISH BELTING AND ASBESTOS, LTD., Scandinavia Mills, Cleckheaton, Yorkshire (Cleckheaton 800).—Brake liners, bushes, bearings and other friction and anti-friction materials for aircraft applications.

BRITISH PLYWOOD MANUFACTURERS, LTD., Wharf Road, Ponders End, Middlesex (Howard 2771).—A.I.D. and A.R.B. approved for plywood for aircraft construction; also metal-faced plywood.

BRITISH WIRE PRODUCTS, LTD., Stourport-on-Severn, Worcestershire (Stourport 240/3).—Trulay and Truloc aircraft control cables and fittings and push-pull controls. **S.B.A.C. Stand 5.**

BROOKS (AUTOS) LTD., T. J., Beech Street, Leicester (Leicester 60987).—A.I.D. and A.R.B. approved for A.G.S. and similar components turned from the bar.

BROWN FOUNDRIES CO., DAVID, Penistone, near Sheffield, Yorkshire (Penistone 135).—High-tensile steel and special alloy castings for gas turbines and also for highly stressed airframe components. **S.B.A.C. Stand 158.**

BROWN BROTHERS (AIRCRAFT), LTD.—See under "Aircraft Parts."

CAPE ASBESTOS CO., LTD., 114-116 Park Street, London, W.1 (Grosvenor 6022).—"Capasco" Asbestos plastics in sheet, moulded, and machined form. "Asbestolux" incombustible board for hangar linings, etc.

COOPERS MECHANICAL JOINTS, LTD.—See under "Aircraft Parts."

DALE, LTD., JOHN, London Colney, St. Albans, Herts (Bowmans Green 2266).—Aluminium alloy gravity die castings for medium- and highly-stressed parts of engines, airframes, controls, etc. A.I.D. and A.R.B. approved.

DARWINS, LTD., Fitzwilliam Works, Sheffield 9 (Sheffield 41341).—High-speed tool and alloy steels; castings; permanent magnets; hack-saw blades; tool-holder bits, files.

DURLX ABRASIVES, LTD.—Name changed to Minnesota Mining and Mfg. Co., Ltd. (*see overleaf*).

ENGLISH STEEL CORPORATION, LTD.—See under "Aircraft Parts."

ENTHOVEN AND SONS, LTD., H. J., 89, Upper Thames Street, London, E.C.4 (Mansion House 4533).—"Superspeed" activated resin-cored solders, A.I.D. and A.R.B. approved. **S.B.A.C. Stand 94.**

FAILSWORTH PLASTICS, Claremont Street, Failsworth, Lancs (Failsworth 2265).—Poly vinyl-chloride-coated felt for aircraft components, A.I.D. approved.

FIBREGLASS, LTD., Ravenhead Works, St. Helens, Lancs (St. Helens 4224).—"Fibreglass" for heat, sound and electrical insulation; of particular value in low-pressure laminates. **S.B.A.C. Stand 143.**

FIRTH AND JOHN BROWN, LTD., THOS., Atlas Works, Sheffield 4 (Sheffield 20081).—Firth Brown Steels for the aircraft industry, as exemplified at Farnborough by a range of components, by photographs, and by a working model of a gas turbine. **S.B.A.C. Stand 39.**

FIRTH-VICKERS STAINLESS STEELS, LTD., Staybrite Works, Sheffield 9 (Sheffield 42051).—Stainless "Staybrite" heat- and creep-resisting aircraft steels in sheet, strip, bars and forgings; centrifugally cast, centri-die-cast and precision-cast components for gas turbines. **S.B.A.C. Stand 145.**

FLATHER, LTD., W. T., Standard Steel Works, Sheffield (Sheffield 41152).—Drawn, turned or ground specification steels for aircraft in alloy and carbon; case-hardening steels for toolroom work; carburising compounds. **S.B.A.C. Stand 118.**

FLEXO PLYWOOD INDUSTRIES, LTD., Flexo Works, South Chingford, London, E.4 (Silverthorn 2666).—Plywood to all aircraft specifications; sandwich constructions using expanded cores such as Onazote, Dufaylite, end-grain balsa, etc., giving a panel of a high strength/weight ratio.

FOX AND CO., LTD., SAMUEL (Associated with The United Steel Cos., Ltd.), Stocksbridge Works, near Sheffield (Oughtibridge 40871).—Alloy, stainless and heat-resisting steels in the form of billets, bars, cold-rolled strip and sheet. **S.B.A.C. Stand 100.**

GENERAL ELECTRIC CO., LTD.—See under "Cabin Equipment."

GLACIER METAL CO., LTD.—See under "Aircraft Parts."

HABERSHON AND SONS, LTD., J. J., Holmes Mills, Rotherham, Yorks (Rotherham 2081-6).—Steels to aircraft specifications, in hot- and cold-rolled strip; sheets, bars and sections. **S.B.A.C. Stand 42.**

HALL AND HALL, LTD., Oldfield Works, Hampton, Middlesex (Molesey 2180).—"Hallprene" synthetic rubber, oil and petrol-resisting mouldings, sheetings, extrusions and oil seals for high- and low-temperature applications; "Hallite" jointing. **S.B.A.C. Stand 87.**

HALL AND PICKLES, LTD., Manchester and Sheffield (Manchester Central 4571).—High-speed, press-tool and hot-die steels; stainless and heat-resisting steels and wire; electrical resistance alloys; engineers' small tools. **S.B.A.C. Stand 175.**

HIGH DUTY ALLOYS, LTD., Slough, Bucks (Slough 23901).—Castings, forgings, stampings, pressings and extrusions in "Hiduminium" and "Magnuminium" aluminium and magnesium alloys. Compressor blades in "Hiduminium," aluminium bronze and Nimonic. **S.B.A.C. Stand 119.**

HUGHES-JOHNSON STAMPINGS, LTD., Langley Green, Birmingham (Broadwell 1361-4).—Drop forgings for the aircraft and engine industry, in carbon and alloy-steels; copper, bronze, brass and aluminium alloys. **S.B.A.C. Stand 75.**

Compressor blading in "Hiduminium", by High Duty Alloys, Ltd.

THE ANCILLARY INDUSTRY . . .

Materials (continued)

I.C.I. PLASTICS DIVISION, Welwyn Garden City, Herts (Welwyn G.C. 3400).—Plastics for aircraft applications; unplasticized "Perspex," "Nuron" low-pressure laminating resins and rigid polyvinyl chloride. **S.B.A.C. Stand 148.**

INTERNATIONAL ALLOYS, LTD., Aylesbury, Bucks (Aylesbury 1010).—Aluminium-alloy ingots.

JABLO PROPELLERS, LTD., Croydon (Croydon 2201).—Compressed laminated wood for aircrews, tools, and jigs. Lightweight expanded plastics as cores for bulkheads, floors, furniture, helicopter blades, bomb doors. **S.B.A.C. Stand 54.**

JESSOP AND SONS, LTD., WILLIAM, Brightside Works, Sheffield (Sheffield 41352).—High-temperature, high-creep-strength scale-resisting steels for stressed components of gas turbines; forged and drop-stamped gas-turbine discs and blades; precision-cast blades; valve steels, constructional steels; crankshafts of all types. **S.B.A.C. Stand 135.**

JONES AND CO., LTD., SAMUEL, New Bridge Street, London, E.C.4 (Central 6500).—Adhesive tapes.

KAUTEX, LTD., Elstree Way, Elstree, Herts (Elstree 1777).—Neo-K-Tex oil-, petrol- and kerosene-resisting jointing materials; sheets, gaskets, washers and mouldings; Kautex anti-vibration and insulating material.

KAYE, LTD., E. AND E., Ponders End, Enfield, Middlesex (Howard 1601).—"K" aluminium and light alloys, in bar, tube, extruded sections, etc.; copper wire and strip, including insulated wire.

KAYSER, ELLISON AND CO., LTD., Carlisle Steel Works, Sheffield, 4 (Sheffield 22124).—High-grade tool, high-speed, alloy, stainless and free-cutting steels, and heat-resisting steels for internal combustion engines.

KING AIRCRAFT CORPORATION, Hillington, Glasgow (Halfway 4571).—Self-sealing couplings, toggle fasteners, pilot harness inertia lock, fuel and oil cocks, metal flexible fireproof couplings, valves and filters, aircraft seating, S.B.A.C. parts. **S.B.A.C. Stand 152.**

KLINGER, LTD., RICHARD, Klingerit Works, Sidcup, Kent (Foots Cray 3022).—A.I.D.-approved compressed-asbestos fibre jointing for steam, oils, acids and refrigerants; "Klinger-Lastic" sheet or moulded rubber-asbestos jointing. "Silastic" silicone rubber joints for extremes of temperatures.

LEE AND SONS, LTD., ARTHUR, Crown Steel and Wire Mills, Sheffield 9 (Sheffield 36931).—Steel strip, bar and wire.

MAGNESIUM ELEKTRON, LTD., Clifton Junction, Manchester (Swinton 2511).—Elektron magnesium-rich alloys; magnesium metal and powder; foundry and welding fluxes. **S.B.A.C. Stand 29.**

H. J. MAYBREY AND CO., LTD., Worsley Bridge Road, London, S.E.26 (Beckenham 0044).—Aluminium sand and gravity die-castings, A.I.D.- and A.R.B.-approved; specifications include D.T.D. 298 and 304.

JAMES MILLS, LTD., EXORS. OF, Woodley, Stockport (Woodley 2231).—A.I.D.-approved bright-steel-bar manufacturers, all sections and many qualities; makers of taper pins, grooved pins, engineers' keys.

MILLS, LTD., WILLIAM, Friar Park Foundry, Wednesbury, Staffs (Stonecross 2276-8).—Founders in all high-strength aluminium alloys; manufacturers of sand, gravity-die and pressure-die castings.

MINNESOTA MINING AND MFG. CO., LTD., Arden Road, Adderley Park, Birmingham, 8 (formerly Durex Abrasives, Ltd.).—"Scotch Boy" masking tapes.

MOND NICKEL CO., LTD., Sunderland House, Curzon Street, London, W.1 (Grosvenor 4131).—Pure nickel; metals of the platinum group; nickel and cobalt oxides and salts; iron powder. **S.B.A.C. Stand 122.**

NORTHERN ALUMINIUM CO., LTD., Bush House, Aldwych, London, W.C.2 (Temple Bar 8430).—"Noral" aluminium and aluminium-alloy sheet, strip, rod, bar, sections, tubes, wire, forgings, castings; "Alpaste" for paint. **S.B.A.C. Stand 80.**

PERRY BARR METAL CO., LTD., Great Barr, Birmingham, 22a (Great Barr 1794).—Aluminium die and sand-castings, machined and unmachined; aluminium fabrications and assemblies.

RENFREW FOUNDRIES, LTD., Hillington, Glasgow, S.W.2 (Halfway 3391).—Aircraft light-alloy castings by sand, pressure and gravity. **S.B.A.C. Stand 19.**

REYNOLDS TUBE CO., LTD., Redfern Road, Tyseley, Birmingham, 11 (Acocks Green 3333).—Seamless steel and alloy-steel tubing, straight or manipulated; welded assemblies; manipulated aluminium tubes and solid sections; fabrication of structures incorporating aluminium alloy tubes, extrusions and sheet; aluminium alloy pressure-vessels. **S.B.A.C. Stand 16.**

ROTHERHAM FORGE AND ROLLING MILLS CO., LTD., Rotherham, Yorks (Rotherham 3281).—Steel sheets, strips, bars, forgings and stampings to A.I.D. and A.R.B. specifications.

SMITH'S STAMPING WORKS (COVENTRY), LTD., Ribble Road Works, Humber Avenue, Coventry (Coventry 3151-3).—Steel drop forgings; specialists in high-temperature and alloy steels for the aircraft industry. **S.B.A.C. Stand 129.**

SOUTHERN FORGE, LTD., Meadfield Road, Langley, Bucks (Langley 301).—Bars, rods, sections, tubes, forgings and stampings in aluminium alloy. **S.B.A.C. Stand 18.**

SORBO, LTD., Woking, Surrey (Woking 966).—Sponge sheet; moulded mechanicals in sponge and solid rubber; oil- and heat-resisting mechanicals; rod, gasket, extrusions; floor covering, upholstery, draught excluder; mountings; sound insulation. A.I.D. and A.R.B. approved.

STERLING METALS, LTD., Coventry (Nuneaton 3471).—Sand and permanent-mould castings in "Elektron" magnesium, zirconium and aluminium alloys, produced from patterns and dies manufactured at Sterling Metals. **S.B.A.C. Stand 23.**

STONE AND CO., J. (CHARLTON), LTD., Woolwich Road, Charlton, London, S.E.7 (Greenwich 3277).—Airframe and engine castings in magnesium, aluminium and copper-base alloys; castings by new precision technique; light-alloy rivets. **S.B.A.C. Stand 24.**

SUFLEX, LTD., 35, Baker Street, London, W.1 (Welbeck 0791-4).—P.V.C. sleeving to many specifications; Breeze sleeving to E. and I.659; varnished cotton sleeving to D.T.D. 320A; tinned copper braids, nylon parachute cord.

T. I. ALUMINIUM, LTD., Redfern Road, Tyseley, Birmingham (Acocks Green 3333).—Aluminium and aluminium alloys in ingot, slab, billet, sheet, strip, tube and extruded forms. **S.B.A.C. Stand 31.**

TRIPLEX SAFETY GLASS CO., LTD., 1, Albemarle Street, London, W.1 (Regent 8171).—Manufacturers of laminated and toughened glass, bullet-proof and multi-ply glass, and moulded thermo-plastic enclosures. **S.B.A.C. Stand 26.**

TUBES, LTD., Aston, Birmingham, 6 (Aston Cross 3030).—Tubular forgings for compressor and turbine shafts; contra-rotating airscrew shafts, variable pitch airscrew parts; cylinder liners; and other components for aircraft. **S.B.A.C. Stand 96.**

TUFNOL, LTD., Perry Barr, Birmingham, 22B (Birchfields 4554).—Makers of "Tufnol" non-metallic, lightweight material for engineering components, including aircraft parts, jigs, electrical insulators, gear wheels, bearings and bushes. **S.B.A.C. Stand 66.**

TUNGUM SALES CO., LTD., Brandon House, Painswick Road, Cheltenham, Glos. (Cheltenham 5856-7).—Tungum alloy in tube, rod, bar, sheet, strip, wire, wire ropes, wire cloth, castings. Tube manipulation and machining in all metals. **S.B.A.C. Stand 135.**

UNITED STEEL COMPANIES, LTD., Westbourne Road, Sheffield, 10 (Sheffield 60081).—Forgings, steel plates, alloy and special steels; steel strip and wire.

VAUGHAN BROTHERS (DROP-FORGINGS), LTD.—See under "Aircraft Parts."

WIGGIN AND CO., LTD., HENRY, Wiggin Street, Birmingham, 16 (Edgbaston 2245).—High-nickel alloys to D.T.D. specification, including the Nimonic series of nickel-chromium alloys for blades and other gas-turbine components. **S.B.A.C. Stand 173.**

WRIGHT AND SONS (VENEERS), LTD., JOHN, Avon Wharf, Longfellow Road, Mile End Road, London, E.3 (Advance 4444).—Veneer cutters for all specified veneers used in aircraft and airscrew-blade construction; manufacturers and stockists of veneers for aircraft interior decoration; timber and veneer consultants. **S.B.A.C. Stand 91.**

YORKSHIRE ENGINEERING SUPPLIES, LTD., "Eatonia" Bronze Foundries, Leeds, 12 (Leeds 38234, 38291).—Sole producers and suppliers of "Eatonia" phosphor-bronze and gun metal castings and bars, and finished machined parts. A.I.D. and A.R.B. approved.

AIRCRAFT PARTS

(Including Airframe and Engine Components and Accessories; Sub-assemblies; A.G.S. Parts, etc.)

A.V.A., LTD., 45-47, York Street, Twickenham, Middlesex (Popesgrove 7931).—Specialists in vibration- and shock-absorbing problems. Manufacturers of A.V.A. vibration absorbers, "Oscillith" flexible bushes, "A.L." shock-absorber mountings. A.R.B. approved.

AERO CONTROLS, LTD., 339, Bedford Road, Kempston, Beds.—Aircraft controls, including rudder bars, columns, screw-jacks, gearing, surface locks, bearings; universal joints; special-purpose ground equipment.

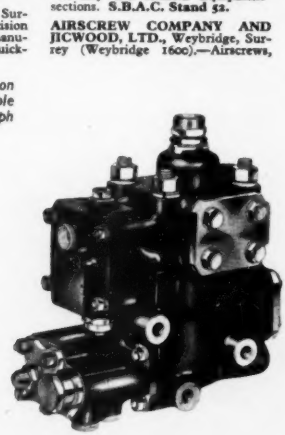
AEROLEX, LTD., Camberley, Surrey (Camberley 1500).—Precision engineers, aircraft-component manufacturers and toolmakers; quick-release lashing equipment, safety-belts, etc. **S.B.A.C. Stand 69.**

AIR SERVICE TRAINING, LTD.—See under "Miscellaneous" heading.

AIRCRAFT MATERIALS, LTD., Midland Road, London, N.W.1 (Euston 6131).—A.G.S., A.S. and B.S. parts and components; quick-release and other fittings for safety equipment; agents for Avery Hardoll pressure-fuelling couplings and ground pressure-fuelling equipment. See also under "Materials" and "Factory and Airfield Equipment" sections. **S.B.A.C. Stand 52.**

AIRSCREW COMPANY AND JICWOOD, LTD., Weybridge, Surrey (Weybridge 1600).—Airscrews,

(Left) Radial-flow oil-cooler, by Serck Radiators, Ltd., as used on Bristol 171 helicopter. (Below) Avica Equipment, Ltd., flexible pipe and union. (Right) Flow-type air/fuel ratio control by Joseph Lucas (Gas Turbine Equipment), Ltd.



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Patent Ejection Seat
continues - with distinction - unrivalled
as the standard seat for both the
Royal Navy and the R. A. F.

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Connolly Leather is specified for seating, panelling and furnishing

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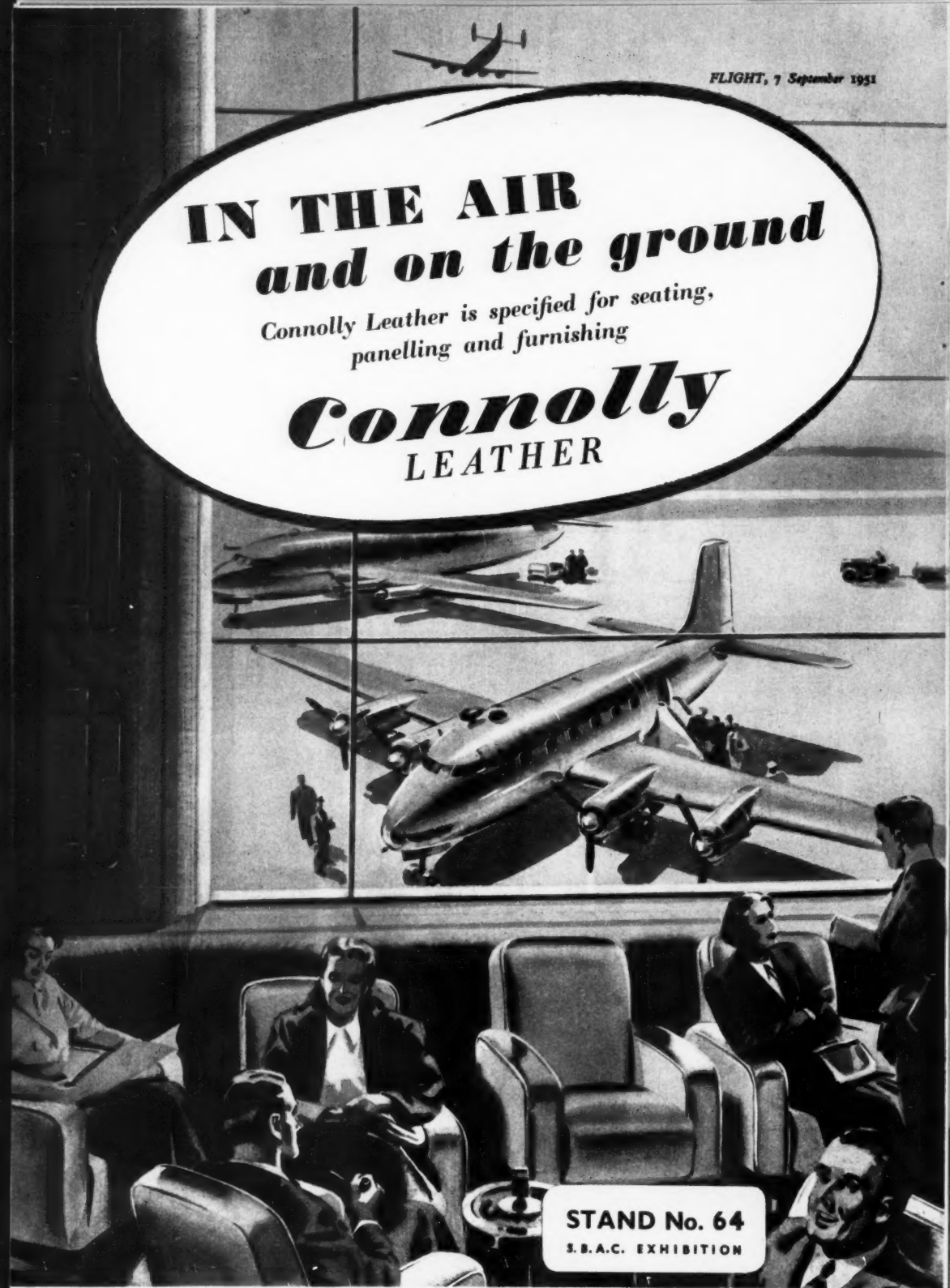


STAND No. 64
S.B.A.C. EXHIBITION

CONNOLLY BROS. (CURRIERS) LTD., CHALTON STREET, EUSTON ROAD, LONDON, N.W.1. 'PHONE: EUSTON 1661

THE ANCILLARY INDUSTRY . . .

Aircraft Parts (continued) . . .

test fans, cabin fans, wind tunnels, sandwich construction for panelling and interior fitments, including flooring, and insulated cabinets. **S.B.A.C. Stand No. 28.**

AMAL, LTD., Holford Works, Perry Barr, Birmingham (Birchfields 4571).—Flame traps, flowmeters for bench tests, jet-calibrating machines; cowling fasteners, light control joints; fuel filters, pressure regulating valves, non-return flap-valves, etc. **S.B.A.C. Stand 149.**

ANGUS AND CO., LTD., GEORGE, Oil Seal Works, Newcastle-on-Tyne 6 (Newcastle 56161 and 59374).—"Gaco" M.I. oil seals (high-precision units for rotating shafts); "Gaco" hydraulic packings for sealing reciprocating shafts or pistons; "Gaco" fuel pump diaphragms, gaskets, tubing, etc.

ARENS CONTROLS, LTD., Tunstall Road, East Croydon, Surrey (Addiscombe 3051-4).—A.I.D. and A.R.B. manufacturers of Arens mechanical remote controls specified by M.O.S. and S.A.E. as a standard design.

ASTON AND CO., LTD., E. S., 5, Sebastian Street, Goswell Road, London, E.C.1 (Clerkenwell 2179).—Cleats, packings, control panels and control knobs, from cast and laminated synthetic resins, etc. A.I.D. and A.R.B. approved.

ATTEWELL AND SONS, LTD., B., Reflection Works, Southall, Middlesex (Southall 2888).—Manufacturers of laminated-aluminium and laminated-brass strips and washers; press tools; small components; plastic panels and canopies; aircraft tableware. **S.B.A.C. Stand 166.**

AUTOMOTIVE PRODUCTS CO., LTD., Tachbrook Road, Leamington Spa (Leamington Spa 2700).—Aircraft hydraulic equipment—see under "Auxiliary Services" review preceding this directory. **S.B.A.C. Stand 81.**

AVERY EQUIPMENT, LTD., Tachbrook Road, Leamington Spa (Leamington Spa 2700). All types of flexible hose and self-sealing couplings for the aircraft industry; pressure fuelling connection (S.B.A.C. standard). **S.B.A.C. Stand 81.**

AVIATION DEVELOPMENTS, LTD.—See under "Factory and Airfield Equipment."

AVICA EQUIPMENT, LTD., Adams Place, Holloway, London N.7.—Metallic and synthetic flexible-pipe assemblies for all fluid systems, hot air and acids; for temperatures up to 300 deg C and pressures up to 6000 lb sq in. **S.B.A.C. Stand 93.**

BAKELITE, LTD.—See under "Materials."

BAWN AND CO., LTD., W. B., Byron Works, Blackhorse Lane, Walthamstow, London, E.17 (Larkswood 4411).—Steel sheet and plate fabrication, road-wagon tankers, etc.

BAXTER, WOODHOUSE AND TAYLOR, LTD., Woodside, Poynton, Cheshire (Poynton 2261).—Electrically heated flying clothing, electrically heated tank covers, etc.

BIRMETALS, LTD.—See under "Materials."

BOLTON AND SONS, LTD., THOMAS, Mersey Copper Works, Widnes, Lancs (Widnes 2022).—Machined forgings and components in copper-bearing alloys; bearings, housings, bushes, liners, sleeves, cylinder head inserts, and other engine and airframe details.

BOORN AND CO., LTD., THOMAS, Venn Street, London, S.W.4 (Macaulay 1181).—Manufacturers of petrol hose, hydraulic packings, jointings. **S.B.A.C. Stand 20.**

BORG AND BECK CO., LTD., Tachbrook Road, Leamington Spa (Leamington Spa 2700).—Clutches for transmission of power to helicopter rotors. **S.B.A.C. Stand 81.**

BRITISH BELTING AND ASBESTOS, LTD.—See under "Materials."

BRITISH MESSIER, LTD., Cheltenham Road East, Gloucester (Churchdown 3281). — Complete undercarriage structures, aircraft wheels, brakes and high pressure hydraulic equipment (see "Auxiliary Services" review preceding this directory). **S.B.A.C. Stand 138.**

BRITISH MOULDED PLASTICS, LTD., 37, Portman Square, London, W.1 (Welbeck 3934).—Designers and makers of all types of thermoplastic and thermosetting mouldings.

BROWN AND CO., LTD., E. G., West Road, Tottenham, London, N.17 (Tottenham 2257).—Sheet-metal workers; fuel and oil tanks, pilot seats, cowlings, pressings and stampings in light sheet metal.

BROWN BROTHERS (AIRCRAFT), LTD., Houghton Road, Northampton (Northampton 4940).—A.G.S., B.S.S. and S.B.A.C. standard parts, Oddie Stiff Nuts, B.B.A.-Rotheswan Aerojacks, airfield equipment, aircraft metals. **S.B.A.C. Stand 37.**

BRUNTONS (MUSSELBURGH), LTD., Wiremills, Musselburgh, Scotland (Musselburgh 28).—Streamline wire, tie rods, aerials and control cables for aircraft.

BURNS, LTD., J., Wangye Works, Chadwell Heath, Essex (Ilford 0166).—Plastic machine parts and components, light alloy presswork and assemblies; anatomatic parts, ferrous and non-ferrous; atomic-hydrogen welding; airframe stowages; formed shapes in Perspex; B.C.H. laminates.

CAPE ASBESTOS CO., LTD.—See under "Materials."

CLAYTON-WRIGHT, LTD., HOWARD, Wellesbourne, Warwickshire (Wellesbourne 316-8).—Aircraft detail fittings, including the Claytonrite rubber-lined anti-vibration clip for piping, cables, etc.

COOPERS MECHANICAL JOINTS, LTD., 14, Liverpool Road, Slough, Bucks (Slough 22373/5).—Oil, petrol and air filters; intake screens, gauze strainers and breathers; gaskets, joints and washers; A.I.D. cork sheet and strip; brass, steel and laminated brass shim. **S.B.A.C. Stand 74.**

CORNERCROFT, LTD., Ace Works, Coventry (Coventry 64123).—Precision engineers, specialists in sheet-metal work and spinning; jigs, tools, assembly fixtures, pressings, plastic moulds and mouldings, etc.

CROSS MANUFACTURING CO. (1938), LTD., 33, Midford Road, Combe Down, Bath (Combe Down 2355).—A.I.D. approved for precision spring washers, circlips and retaining rings, labyrinth seals for jet engines.

DANIEL AND CO., LTD., D. A., Machynlleth, N. Wales (Machynlleth 116/7).—Aircraft seating equipment for cabin and de-icing systems (see under "Auxiliary Services" review preceding this directory). **S.B.A.C. Stand 4.**

DE HAVILLAND PROPELLERS, LTD.—See under "Auxiliary Services" review preceding this directory.

DELANEY GALLAY, LTD., Edgware Road, Cricklewood, N.W.2 (Gladstone 2201).—Oil coolers; radiators; cabin heaters; exhaust gas-heat exchangers (see under "Auxiliary Services" review preceding this directory); sheet-metal and presswork; research and test equipment for arctic conditions. **S.B.A.C. Stand 121.**

DELCO-REMY AND HYATT, LTD.—See under "Auxiliary Services" review preceding this directory.

DOWTY EQUIPMENT, LTD., Arle Court, Cheltenham, Glos (Cheltenham 53471).—Aircraft landing gear, hydraulic and electro-hydraulic equipment, gas-turbine fuel pumps, fuel-control systems (see "Auxiliary Services" review preceding this directory); synthetic rubber seals. **S.B.A.C. Stand 9.**

DOWTY EQUIPMENT OF CANADA, LTD.—See above. **S.B.A.C. Stand 6.**

DOWTY SEALS, LTD.—See above. **S.B.A.C. Stand 9.**

DUNLOP RUBBER CO., LTD., Aviation Division, Holbrook Lane, Foleshill, Coventry (Coventry 88733).—Tyres, wheels, brakes, pneumatic and hydraulic operating equipment, jacks, selector valves, de-icing equipment (see under "Auxiliary Services" review preceding this directory); windscreen wipers, compressors, flexible pipes and rubber accessories. **S.B.A.C. Stand 40.**

DZUS FASTENER EUROPE, LTD., 164/148 Westminster Bridge Road, London, S.E.1 (Waterloo 7114).—Manufacturers of the Dzus self-locking, self-ejecting, supersonic and panel-mounting fasteners for cowlings, inspection panels, etc.

E.N.V. ENGINEERING CO., LTD., Hythe Road, London, N.W.10 (Ladbrooke 3622).—Straight-tooth and spiral bevel gears, helical and straight-tooth spur gears, Zerol-type bevel gears, ground-profile Zerol, spiral-bevel and spur gears. **S.B.A.C. Stand 116.**

ELECTRO-HYDRAULICS, LTD., Liverpool Road, Warrington, Lancs (Warrington 2244).—Designers and manufacturers of aircraft undercarriages and hydraulic, pneumatic and electro-hydraulic equipment (see under "Auxiliary Services" review preceding this directory). **S.B.A.C. Stand 36.**

ENGLISH STEEL CORPORATION, LTD., Sheffield 9 (Sheffield 41071).—Drop-forged gas-turbine discs, drop-forged finish-machined crankshafts and other aircraft components; engineers' cutting tools, as used extensively in the aircraft industry. **S.B.A.C. Stand 102.**

EQUATOR WHEELS AND SECTIONS, LTD., Raglan Street, Wolverhampton (Wolverhampton 21605-6).—Specialists in cold rolling, forming and coiling for the aircraft industry.

ESSEX AERO, LTD., The Airport, Gravesend, Kent (Gravesend 4261).—Specialists in aircraft components (tanks, door and window framings, etc.) in magnesium alloy. A.I.D., A.R.B.

EVERSHED AND VIGNOLES, LTD., Chiswick, London, W.4 (Chiswick 3670).—Electrically operated throttle controls, airscrew-pitch controls and trim-tab controls. "Megger" insulation and bond testers.

EXACTOR, LTD., 108 Park Street, London, W.1 (Mayfair 0252).—Self-sealing pipe couplings for refuelling equipment and pressure lines; ground equipment hydraulics; fuel-flow test rigs; Exactor-Trabon centralized lubrication. (See also under "Auxiliary Services" review preceding this directory). **S.B.A.C. Stand 56.**

FIREPROOF TANKS, LTD., The Airport, Portsmouth, Hants (Portsmouth 2367).—Designers and manufacturers of flexible fuel tanks, self-sealing, crashproof and flame-resistant covers for metal tanks, aluminium firewalls, etc. (see also under "Auxiliary Services" review preceding this directory). Rubber mouldings resistant to fuels at high and low temperatures. **S.B.A.C. Stand 159.**

FIRESTONE TYRE AND RUBBER CO., LTD., Great West Road, Brentford, Middlesex (Ealing 3456).—Pneumatic tyres and tubes for aircraft and airfield transport. Bonded rubber-to-metal anti-vibration mountings. **S.B.A.C. Stand 151.**

FISCHER BEARINGS CO., LTD., Upper Villiers Street, Wolverhampton (Wolverhampton 26101).—Ball and parallel-roller bearings for every purpose, including precision bearings for jet and piston engines.

GAINSBOROUGH ENGINEERING CO. (OLDHAM), LTD., Roscoe Street, Oldham, Lancs (Oldham Main 2424).—Airframe structures, components and details; fabrication and general sheet-metal work.

GIRLING, LTD., King's Road, Tyseley, Birmingham (Acocks Green 2831).—Aircraft braking equipment (see under "Auxiliary Services" review preceding this directory). **S.B.A.C. Stand 120.**

GLACIER METAL CO., LTD., Alperton, Wembley, Middlesex (Perivale 4271).—Engine bearings, steel backed white metal and copper lead-lined; bronze-backed, white-metalled; bronze-backed unlined. Bronze bushes. Standard wrapped bushes. Bronze bars.

GOODYEAR TYRE AND RUBBER CO., LTD., Wolverhampton (Wolverhampton 23321).—Aircraft tyres and tubes, wheels and brakes, and cross-wind landing gear (see under "Auxiliary Services" review preceding this directory); fuel hoses. **S.B.A.C. Stand 163.**

GUEST KEEN AND NETTLEFOLDS (MIDLANDS), LTD., Screw Division, Heath Street, Birmingham, 18 (Smethwick 1441).—Wood screws in steel, brass, copper, stainless steel and aluminium alloy; self-tapping screws; cotter pins; drive screws; screwnails; aircraft bolts, nuts and rivets; "Aerotight" stiff nuts; Phillips recessed-head screws and bolts; "Sems" fastener units. **S.B.A.C. Stand 47.**

HEADLAND, LTD., THOS. P., 164/168, Westminster Bridge Road, London, S.E.1 (Waterloo 5353).—Manufacturers and stockists of A.G.S., A.S. and B.S.S. parts and components; sole distributors of "Dzus" cowling and panel fasteners.

HELLERMAN ELECTRIC, LTD.—See under "Electrical."

HIGH-PRESSURE COMPONENTS, LTD., 12, Grosvenor Gardens, London, S.W.1 (Tate Gallery 0394)—Pipe couplings for hose and metal pipes; air-charging valves; A.G.S. parts.

HOBSON, LTD., H. M. Fordhouses, Wolverhampton, Staffordshire (Fordhouses 2266).—Injection and float-type carburettors; engine (cockpit) controls; power flying controls; fuel-injection pumps; gas-turbine engine accessories (see also under "Auxiliary Services" review preceding this directory). **S.B.A.C. Stand 55.**

HORDERN-RICHMOND, LTD.—See under "Factory and Airfield Equipment" and under "Auxiliary Services" review preceding this directory.

Saunders 4in. spherical-plug cock—motorized type, with triple-diaphragm seating and glandless, "full-bore" construction.

THE ANCILLARY INDUSTRY . . .

Aircraft Parts (continued) . . .

HYMATIC ENGINEERING CO., LTD., Glover Street, Redditch, Worcs (Redditch 743).—High-pressure compressors and control valves for various functions; aircraft pneumatic test gear and pneumatic rams; pneumatic tools for industrial purposes. (See also under "Auxiliary Services" review preceding this directory.) **S.B.A.C. Stand 97.**

HARDY SPICER AND CO., LTD., Witton, Birmingham, 6.—Universal joints for aircraft applications; needle; roller and trunnion units for gearbox drive shafts and ancillary units.

INTEGRAL, LTD., Cousins Street, Wolverhampton (Wolverhampton 24984-6).—Design and manufacture of hydraulic pumps and motors for aircraft services; control valves and automatic cut-outs, relief and sequence valves, etc. (See also under "Auxiliary Services" review preceding this directory.) **S.B.A.C. Stand 53.**

LAYCOCK ENGINEERING CO., LTD., Victoria Works, Millhouses, Sheffield, 8 (Sheffield 70041).—Aircraft engine components; airframe components; precision engineering.

LANCEFIELD COACHWORKS, Wrenfield Place, Herries Street, London, W.10 (Ladbroke 2951).—Exhaust manifolds and other pipework for the aircraft industry, including gas-turbine tailpipes; cowlings and other presswork; seats and harnesses. **S.B.A.C. Stand 73.**

LINREAD, LTD., Cox Street, Birmingham, 3 (Central 3951).—Phillips recess-head, slotted, and hexagon bolts and screws; rivets; Rivnuts; pressings; to all aircraft specifications.

JOSEPH LUCAS (GAS TURBINE EQUIPMENT), LTD., Birmingham, 28 (Springfield 3232).—Research, design, development and manufacture of fuel systems, hydraulic control systems, and combustion equipment, including de-icing heaters. (See also in "Auxiliary Services" review preceding this directory.) **S.B.A.C. Stand 173.**

M.L. AVIATION CO., LTD.—See under "Military Aircraft Special Equipment."

M.L. ENGINEERING CO., LTD.—See under "Military Aircraft Special Equipment."

MARSTON EXCELSIOR, LTD., Fordhouses, Wolverhampton.—"Flexelite" flexible fuel tanks; light-alloy heat-exchange equipment; sheet-metal fabrication and machined components; Nuron laminates for radar. (See also under "Auxiliary Services" review preceding this directory.) **S.B.A.C. Stand 142.**

MASSON SEELEY AND CO., LTD., 14, Howick Place, London, S.W.1 (Victoria 2151).—The Masseeley marking machine for part-marking and factory-line production of calibrated dials, direction plates, nameplates, etc., for aircraft. Also component engineering and machining; jigs, tools and fixtures, and assemblies.

METALASTIK, LTD., Evington Valley Road, Leicester (Leicester 37281).—Rubber-to-metal-weld components for engine suspension, fuel tank, radiator, header tank mountings, instrument and instrument-panel mountings, engine-transporter mountings, flexible-drive couplings.

METALLISATION, LTD.—See under "Paints and Finishes."

MOLLART ENGINEERING CO., LTD.—See under "Factory and Airfield Equipment."

MOSELEY AND SONS, LTD., DAVID.—See under "Cabin Equipment."

MOUNTFORD (BIRMINGHAM), LTD., FREDK., Fremo Works, Moseley Street, Birmingham, 5 (Midland 3488).—Taper pins, stainless-steel bolts and nuts, repetition component parts.

NETTLEFOLD AND MOZER, LTD., 176-194, Borough High Street, London, S.E.1 (Hop 7111) and Dunnings Bridge Road, Aintree, Liverpool 10 (Aintree 4171).—Stockholders and distributors of A.G.S. parts and aircraft steels.

NORMALAIR, LTD., West Hendford, Yeovil, Somerset (Yeovil 1100).—Research and development work into problems of high-altitude flight, particularly concerning cabin-atmosphere control and oxygen supply. Design and manufacture of such equipment for civil and military aircraft. (See also under "Auxiliary Services" review preceding this directory.) **S.B.A.C. Stand 172.**

ODDIE FASTENERS, Portswood Road, Southampton (Southampton 55883).—Patented Oddie fasteners and quick-release pins. "Solidlock" shear fasteners; cupboard fasteners; special fasteners to customers' requirements.

PALMER TYRE, LTD., Penfold Street, London, N.W.8 (Paddington 8822).—Aircraft tyres, wheels and brakes; "Silvoflex" piping; hydraulic control units, pneumatic valves, etc. (See also under "Auxiliary Services" review preceding this directory.) **S.B.A.C. Stand 41.**

PERRY BARR METAL CO., LTD.—See under "Materials."

PEST CONTROL, LTD.—See under "Miscellaneous."

PLESSEY CO., LTD.—See under "Electrical."

POWER FLEXIBLE TUBING CO., LTD., Derby Works, London, N.4 (Stamford Hill 6696).—Flexible tubing and bellows in stainless steel, bronze and aluminium, for fuel/oil lines, instruments and cabin heating. Bellows-type expansion joints for gas-turbine ducting.

POWIS AND SONS, LTD., D., Golden Hillock Road, Sparkbrook, Birmingham (Victoria 1264-8).—Rivets, washers, split-pins, etc., in all aircraft materials.

PRECISION RUBBERS, LTD., Bagworth, Leicestershire (Bagworth 251).—Rubber components to strict dimensional and material quality-control for aircraft engines and electrical equipment. Diaphragms and bonded parts. Prototypes or bulk production. **S.B.A.C. Stand 168.**

PRESSED STEEL CO., LTD., Cowley, Oxford.—Sheet-metal work and sub-assemblies. **S.B.A.C. Stand 115.**

PULSOMETER ENGINEERING CO., LTD., London and Reading (Reading 67182).—Manufacturers of electrically driven fuel booster pumps for military and civil aircraft. A.I.D. and A.R.B. approved.

PYTRAM, LTD., Pytram Works, Dunbar Road, New Malden, Surrey (Malden 3225-7).—Complex seamless ducting for aircraft heating and air-conditioning, in laminated cellulose fibre. A.I.D. and A.R.B. approved.

Pulsometer Engineering Co.: FB6 Mk 3 aircraft fuel pump.

R.F.D. CO., LTD.—See under "Military Aircraft Special Equipment."

RANSOME AND MARLES BEARING CO., LTD., Stanley Works, Newark-on-Trent (Newark 456-9).—Manufacturers of all types of ball and roller bearings, including special types for aircraft engines, superchargers, jet units, controls, airscrews and landing wheels.

REDWING, LTD., 340, Bensham Lane, Thornton Heath, Croydon (Thornton Heath 3663).—Aeronautical and light engineering design and development. Toolmaking, quantity production and processing. A.I.D. and A.R.B. approved. Specialists in light alloy sheet fabrication.

REYNOLDS TUBE CO., LTD.—See under "Materials."

RILEY, LTD., ROBERT, Milkstone Spring Works, Rochdale (Rochdale 2237).—Springs for all aircraft applications.

ROBINSON AND CO. (GILLINGHAM), LTD., 22, London Chambers, Gillingham, Kent.—"Jubilee" hose clips.

ROSS, COURTNEY AND CO., LTD., Ashbrook Road, London, N.19 (Archway 1166-7).—Tags, terminals, A.G.S. parts. A.I.D., A.R.B.

ROSS LTD., S. GRAHAME, 45-51, Beauchamp Place, London, S.W.3.—Jarret cam cone fasteners; also airfield equipment and marine-aircraft handling equipment.

ROTAX, LTD., London, N.W.10 (Elgar 7777).—Designers and engineers of complete electrical systems for aircraft; manufacturing and servicing of generating, starting and ignition systems for all types of engines; actuators and switchgear. (See also under "Auxiliary Services" review preceding this directory.) **S.B.A.C. Stand 134.**

ROTOL, LTD., Gloucester (Gloucester 24431).—Manufacturers of aircraft and marine propellers and aircraft equipment. Installations on engines of 120/250 b.h.p. to co-axial airscrews absorbing up to 7,000 b.h.p. for gas turbines. (See also under "Auxiliary Services" review preceding this directory.) **S.B.A.C. Stand 76.**

RUBERY, OWEN AND CO., LTD., Darlaston, South Staffs (Darlaston 130).—Aircraft general sundries, bolts and nuts (cold-headed, heat-treated, stainless steel, bright high-tensile steel); control columns, flight progress-board equipment. **S.B.A.C. Stand 177.**

SALTER AND CO., LTD., GEO., High Street, West Bromwich (West Bromwich 1331).—Springs, tension, torsion and compression; wire-forms, circlips, etc. Roller bearings with flexible or solid rollers, needle rollers, etc.

SANKEY AND SONS, LTD., JOSEPH, Albert Street Works, Bilston, Staffs (Bilston 41161).—Complete assemblies for gas turbines and airscrew spinners. Pressed, fabricated, and machined components, in heat and corrosion-resisting materials. **S.B.A.C. Stand 157.**

SAUNDERS VALVE CO., LTD., Cwmbran, Newport, Mon. (Cwmbran 3281).—Manually and electrically operated cocks and gate valves for fuel, oil, hot air, oxygen, nitrogen, vacuum, low-pressure hydraulics and water injection; jettison valves and filters; diaphragm valves for all ground installations. **S.B.A.C. Stand 165.**

SEARLE AIRCRAFT SHEET METAL WORKS, LTD., Arlington Road, London, N.W.1.—Light and medium pressings; all types of welding and sheet metal work, etc. A.I.D. and A.R.B. approved.

SELF-PRIMING PUMP AND ENGINEERING CO., LTD., Trading Estate, Slough, Bucks (Slough 23277).—Fuel booster pumps, methanol/water injection pumps, cabin-heater pumps; inverted flight valves; fuel recuperators; non-return valves; float valves and fuel-system accessories. **S.B.A.C. Stand 141.**

SERCK RADIATORS, LTD., Warwick Road, Birmingham 11 (Victoria 0531).—Design and production of heat-exchange equipment, including radiators and light-alloy radial-flow oil-coolers.

SILENTBLOC, LTD., Ladbroke Road, London, W.11 (Park 9821).—Flexible bearings, flexible couplings and anti-vibration mountings as used in airframe and engine assembly for the past 20 years. **S.B.A.C. Stand 59.**

SIMMONDS AEROCESSORIES, LTD., Treforest, Glamorgan (Taffs Well 222).—Pacitor electronic fuel contents gauge (see under "Instruments" in "Auxiliary Services" review preceding this directory); Nyloc self-locking nuts; Spire Speed nuts and fasteners. **S.B.A.C. Stand 137.**

SKEFKO BALL BEARING CO., LTD., Luton, Beds (Luton 5700).—Ball and roller bearings of all types, including aircraft control bearings, pulleys and rubber-tyred ball-bearing rollers.

SPARKLETS, LTD., Upper Edmonton, London, N.18 (Tottenham 2647).—Sparklets refillable syphons in lightweight metal; life-jacket inflators; pressure die castings; woven wire braiding in high-conductivity wire.

SPLINTEX SAFETY GLASS, LTD., Nightingale Road, Hanwell, London, W.7 (Ealing 6711).—A.I.D. and A.R.B. aircraft hoods, windows and windscreens, interior fittings, instrument panels; plastic mouldings; laminated and toughened glass.

SUFLEX, LTD.—See under "Materials."

SUNTEX SAFETY GLASS INDUSTRIES, LTD., Thorney Lane, Iver, Bucks (Iver 473).—Perspex, acetate and safety glass panels for various aircraft, incorporating two-stage amber training scheme; polymerised welded Perspex tubing; instrument glasses, etc. **S.B.A.C. Stand 156.**

SUPERFLEXIT, LTD., Buckingham Avenue, Slough (Slough 21364-5).—Flexible tubing for fuels and oils; Air Ministry approved, Specification D.T.D. 1014.

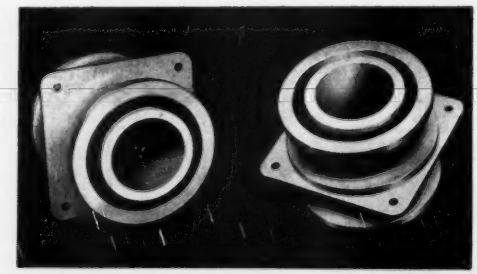
TECALEMIT, LTD.—See under "Fuels and Oils."

TEDDINGTON CONTROLS, LTD., Merthyr Tydfil, South Wales (Merthyr Tydfil 666).—Electro-pneumatic, hydraulic and fuel valves; pneumatic jacks; pressure switches and control valves; thermostatic inching controls; cabin heater and temperature control equipment; seamless metal bellows and packless glands; hot air valves; time switches. (See also under "Auxiliary Service" review preceding this directory.) **S.B.A.C. Stand 86.**

TELEFLEX PRODUCTS, LTD., High Road, Chadwell Heath, Essex (Seven Kings 5771).—M.O.S.-approved for design of mechanical remote-control systems for aircraft. **S.B.A.C. Stand 103.**

TEMPERED SPRING CO., LTD., Warren Street, Sheffield, 4 (Sheffield 21333). Aircraft engine valve springs and similar high-duty springs for aircraft.

"Silentbloc" wing-root bearings for Vickers Viking, Varsity and Valetta



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THE ANCILLARY INDUSTRY . . .

Aircraft Parts (continued . . .)

TENAPLAS (SALES), LTD., 24/25, Manchester Square, London, W.1 (Welbeck 7941).—Extruded plastics: water piping, insulated wires, insulating sleevings, window weathering strips, sections for interior decoration, etc.; special sections to order.

TERRY AND SONS, LTD., HERBERT, Redditch (Redditch 61).—Steel springs for all aircraft purposes; presswork; "Anglepoise" lamps.

THERMO-PLASTICS, LTD., Luton Road Works, Dunstable, Beds. (Dunstable 686 and 777).—Components manufactured from all types of plastic materials, including Perspex, cellulose acetate, Bakelite, urea, polythene, polystyrene, rigid P.V.C. laminated Fibreglass, etc.; Perspex hoods and canopies; Perspex bonded to rubber and metal. **S.B.A.C. Stand 77.**

T.K.S. (AIRCRAFT DE-ICING), LTD., Drayton House, Gordon Street, London, W.C.1 (Euston 4650).—See under "De-icing" section of "Auxiliary Services" review preceding this directory. **S.B.A.C. Stand 155.**

TRIPLEX SAFETY GLASS CO., LTD.—See under "Materials."

RONALD TRIST AND CO., LTD., Bath Road, Slough (Slough 20222).—"Seatrist" gland rings, cups and collars; moulded hydraulic seals; oil seals, sealing rings and diaphragms in oil- and fuel-resisting synthetic rubbers to D.T.D. specifications; hydraulic jacks, oleos, refueling couplings, etc.

TUBES, LTD.—See under "Materials."

TUNGUM SALES CO., LTD.—See under "Materials."

VANDERVELL PRODUCTS, LTD., Western Avenue, London, W.3 (Acorn 2251).—Thin-wall bearings for aircraft-engine main and big-end bearings; bushings; thrust washers.

VAUGHAN BROTHERS (DROP-FORGINGS), LTD., Eagle Works, Willenhall, Staffs. (Willenhall 436-8).—Drop forgings; machinists; aircraft shackles.

VENNER TIME SWITCHES, LTD.—See under "Electrical."

VICKERS-ARMSTRONGS, LTD., Vickers House, Broadway, London, S.W.1 (Abbey 7777).—Fuel cocks, automatically and electrically actuated; non-return valves, etc. **S.B.A.C. Stand L.**

VOKES, LTD., Henley Park, Guildford, Surrey (Guildford 62861).—Air, oil and fuel filters; silencing equipment; flame dampers. **S.B.A.C. Stand 25.**

WELLS AND CO., LTD., A., Stirling Road, London, E.17 (Larkswood 2691).—"Equiflex" all-metal spring mountings, as used in the English Electric Canberra.

WELLWORTHY PISTON RINGS, LTD., Lymington, Hants (Lymington 520).—Pistons, rings, sleeves, gudgeon-pins; aluminium castings; "Al-fin" aluminium-to-steel bonding process; "Wellseal" jointing compound. **S.B.A.C. Stand 72.**

WESTERN MANUFACTURING ESTATE, LTD., Aircraft Division, The Aerodrome, Reading, Berkshire (Sonning 2351).—Designers and manufacturers of electrical actuators, trim switches, motors, indicators, and other aircraft components. (See under "Electric Actuation" in "Auxiliary Services" review preceding this directory). Pressings and stampings in light sheet metals; aircraft sub-assemblies; accessories for all types of aircraft. **S.B.A.C. Stand 70.**

CHARLES WESTON AND CO., LTD., Irwell Bank Works, Douglas Green, Pendleton, Salford, 6, Lancs. (Pendleton 2857-9).—"Weston" leather and synthetic rubber oilseals. Synthetic rubber mouldings and sealing devices to meet special conditions. A.I.D. and A.R.B. approved.

WEYBURN ENGINEERING CO., LTD., Elstead, Surrey (Elstead 2141-3).—Aircraft-engine components; specialists in crankshafts and camshafts.

WOKINGHAM PLASTICS, LTD., Denton, Road, Wokingham, Berks. (Wokingham 700).—A.I.D.-approved manufacturers of thermo-plastic pressurised hoods, canopies, windows, mouldings, in acetate, P.V.C. and co-polymer sheet.

Y.S.C., LTD., THE, 45-7, Copeland Road, London, S.E.15 (New Cross 6133).—Aircraft parts (small components, precision bolts, screws, bushes, in all metals); sheet metal work, with welding and Sif-bronzing; general components. Standard Y.S.C. Very cartridges and pistols, and aeronautical pyrotechnics.

YORKSHIRE ENGINEERING SUPPLIES, LTD.—See under "Materials."

CHLORIDE BATTERIES, LTD., Exide Works, Clifton Junction, near Manchester (Manchester Swinton 2011).—Exide lightweight batteries for civil and Service aircraft and heavy-duty ground-starting units. **S.B.A.C. Stand 104.**

COLE, LTD., E. K., Ekco Works, Southend-on-Sea, Essex (Southend 49491).—Communications, radar and navigation equipment, including simplified V.H.F. equipment for ground stations and light aircraft; Ekco search radar, as manufactured for B.O.A.C. **S.B.A.C. Stand 21.**

COSSOR RADAR, LTD., Cossor House, Highbury Grove, London, N.5 (Canonbury 1234).—Aircraft H.F. and V.H.F. transmitting and receiving equipment; ground station equipment; airfield control apparatus; other radio and radar equipment. **S.B.A.C. Stand 84.**

DECCA NAVIGATOR CO., LTD., 1-3, Brixton Road, London, S.W.9 (Reliance 3311 and 4421).—Radio-navigational equipment, including the Flight Log pictorial presentation unit. **S.B.A.C. Stand 65.**

FERRANTI, LTD., Crewe Toll, Edinburgh (Granton 89181).—Gyro gun-sights for fighter equipment; distance-measuring equipment—ground beacon and aerial systems; hermetically sealed transformers; industrial electronic equipment and valves. **S.B.A.C. Stand 15.**

GENERAL ELECTRIC CO., LTD.—See under "Cabin Equipment."

HARLEY AIRCRAFT LANDING LAMPS, St. Neots, Huntingdonshire (St. Neots 230).—Aircraft landing lamps; taxying and manoeuvring lamps for aeroplanes, flying-boats and surface craft; mobile and airfield floodlighting. **S.B.A.C. Stand 89.**

HELLERMANN ELECTRIC, LTD., Tinsley Lane, Crawley, Sussex (Crawley 747).—Cable markers, binding sleeves, wire strippers, multi-way cable waterproofing sleeves; rubber and synthetic grommets, plastic mouldings.

INTERNATIONAL AERADIO, LTD., 40, Park Street, London, W.1 (Regent 5024).—Installation, operation and maintenance of air radio equipment; air traffic control; radio engineering layouts; Aerad flight guides, maps, charts and other navigational needs.

K.L.G. SPARKING PLUGS, LTD., Putney Vale, London, S.W.15 (Putney 8111).—Manufacturers of K.L.G. sparking plugs incorporating "Corundite" insulation; also makers of a complete range of afterburner igniters; engine-ignition harness equipment and igniters and thermo-couples for gas turbines. **S.B.A.C. Stand 11.**

LODGE PLUGS, LTD., Rugby, Warwickshire (Rugby 2076).—Lodge aviation sparking plugs for all makes and types of engines; igniter plugs for gas turbines; servicing and testing equipment. **S.B.A.C. Stand 33.**

MARCONI'S WIRELESS TELEGRAPH CO., LTD., Marconi House, Chelmsford (Chelmsford 3221).—Airport and airborne wireless installations, covering a full range of communication, navigational and intercommunication equipments. **S.B.A.C. Stand 48.**

McMICHAEL RADIO, LTD., Slough, Bucks (Slough 23311).—Radio, electronic and electrical aircraft equipment and ancillaries; precision electronic research instruments for airborne and ground laboratory use. **S.B.A.C. Stand 174.**

MURPHY RADIO, LTD., Welwyn Garden City, Herts (Welwyn G.C. 800).—Airborne and ground radar, communication and navigation equipment; electrical and test equipment. **S.B.A.C. Stand 153.**

NEWTON BROTHERS (DERBY), LTD., Alfreton Road, Derby (Derby 47676).—Electrical equipment for aircraft, including automatic carbon-pile voltage-regulators, rotary transformers and converters; aircraft generators, wind- and engine-driven. **S.B.A.C. Stand 105.**

NIFE BATTERIES, Redditch, Worcs (Redditch 157).—Manufacturers of "Nife" all-steel batteries, with alkaline electrolyte, for all aircraft purposes.

ELECTRICAL

(*Including Radio, Radar and Electronics*)

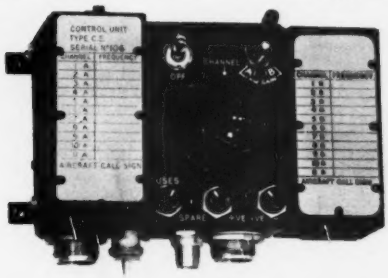
AIRMEC LABORATORIES, LTD., High Wycombe, Bucks (High Wycombe 2060).—Radio communications, aircraft intercommunication systems, radio test gear, electronic controls.

BRITISH INSULATED CALLENDER'S CABLES, LTD., Norfolk House, Norfolk Street, London, W.C.2 (Museum 1600).—Aircraft electric cables, including Pren, Prenal, Glasil and Glasef types. Also P.T.F.E. connecting wires, sleevings, R.F. and high-energy ignition cables; aluminium and other polythene-insulated cables; miniature multiway instrument cables; moulded connectors and flexible waveguides for radar. **S.B.A.C. Stand 50.**

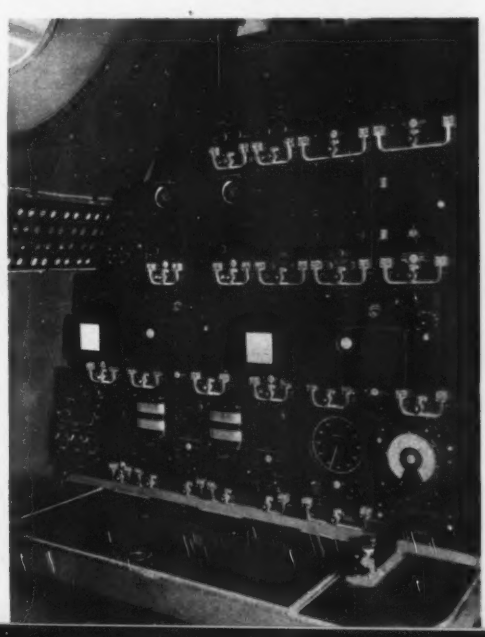
BRUSH CRYSTAL CO. OF GREAT BRITAIN, Hythe, Southampton (Hythe 3265).—Production of all types of crystals for use in the telecommunications field.

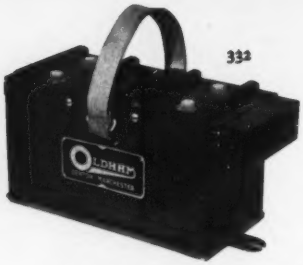
BRITISH THOMSON-HOUSTON CO., LTD., Coventry (Coventry 64181).—Aircraft magnetos; booster coils; a.c. and d.c. motors; generators; actuators; switches; circuit-breakers; electronic voltage-regulators; turbo-starters; Mazda lamps and lighting equipment (see also under "Auxiliary Services" review preceding this directory). **S.B.A.C. Stand 49.**

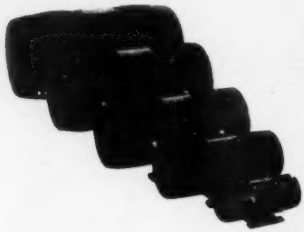
Control unit of new 22-channel Ekco V.H.F. radio equipment.

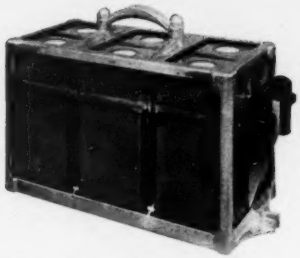


Marconi equipment in the Comet: Top row, intercom units, AD.107 transmitter power units; second row, aircraft switchboard, voltage regulators, AD.7092A D/F. units, spares box; third row, AD.107 drives and amplifiers; bottom row, intercom station box, D/F. switch box, AD.94 receivers, D/F. indicator and loop control, and D/F. control unit.









(Left) Oldham 12-volt 60-amp aircraft battery. (Centre) Range of Newton Bros. lightweight rotary transformers. (Right) New Dagenite Type 6-EP19-B lightweight battery (Peto and Radford).

THE ANCILLARY INDUSTRY . . .

Electrical (continued) . . .

OLDHAM AND SON, LTD., Denton, Manchester (Denton 2431).—Manufacturers of aircraft batteries and ground-starter batteries, fitted with the Oldham patent "Fibrak" separator. **S.B.A.C. Stand 171.**

PETO AND RADFORD, 50, Grosvenor Gardens, London, S.W.1 (Sloane 1764).—"Dagenite" batteries, fitted with Porvic separators, polythene connector covers and vents, for all types of aircraft; ground-starting units. **S.B.A.C. Stand 123.**

PLESSEY CO., LTD., Ilford, Essex (Ilford 3040).—Cartridge starters, electric actuators, airborne and traffic communications equipment, plugs and sockets and complete wiring systems, electrical accessories, aeronautical pumps and valves. (See also under "Auxiliary Services" review preceding this directory.) **S.B.A.C. Stand 113.**

PLESSEY INTERNATIONAL, LTD., Ilford, Essex (Ilford 3040).—The overseas sales organization of the Plessey Co. **S.B.A.C. Stand 112.**

PULLIN AND CO., LTD., R. B.,—See under "Instruments."

PYE, LTD., Cambridge (Cambridge 3434).—Instrument-landing systems; radio telephones; V.H.F. transmitters; walkie-talkies; crash switches, providing automatic protection against fire and other hazards; research and test equipment. **S.B.A.C. Stand 167.**

REDIFON, LTD., Broomhill Road, London, S.W.18 (Vandyke 7281).—M.F., H.F. and V.H.F. communications and navigational-aid equipment for airfields and airports. Flight simulators and trainers. Audio equipment for aircraft and airport announcement systems. **S.B.A.C. Stand 130.**

ST. HELEN'S CABLE AND RUBBER CO., LTD., Slough, Bucks (Slough 20333).—Prem aircraft cables, as used in the D.H. Comet.

SALFORD ELECTRICAL INSTRUMENTS, LTD.—See under "Instruments."

SAVAGE AND PARSONS, LTD., Watford By-pass, Watford, Herts. (Watford 6071).—Airborne searchlights; industrial and research stress-recording equipment, electronic apparatus, photo-flash equipment. **S.B.A.C. Stand 34.**

STANDARD TELEPHONES AND CABLES, LTD., Connaught House, Aldwych, London, W.C.2 (Holborn 8765).—V.H.F. and high-power H.F. multi-channel radio communication equipment; I.L.S. receivers; radio-altimeters; voltage regulator and rotary converter; lightweight "Sen-TerCel" rectifiers; sound-level and frequency-analyzing equipment. **S.B.A.C. Stand 136.**

THERMIONIC PRODUCTS, LTD., Hythe, Southampton (Hythe 3265).—Manufacturers of the Thermionic multi-channel airport recorder and all types of magnetic recording equipment, including the Soundmirror magnetic-tape recorder.

ULTRA ELECTRIC, LTD., Western Avenue, London, W.3 (Acorn 3434).—Designers and manufacturers of aircraft radio equipment, navigational aids and electronic-control devices. Aircraft throttle, speed and temperature control systems; airliner internal communication systems. (See also under "Auxiliary Services" review preceding this directory.) **S.B.A.C. Stand 150.**

VENNER ACCUMULATORS, LTD., Kingston By-Pass, New Malden, Surrey (Malden 2442).—Ultra-lightweight accumulators, including new type designed for heavy discharge rate required for gas-turbine starting. **S.B.A.C. Stand 79.**

VENNER TIME SWITCHES, LTD., Kingston By-Pass, New Malden, Surrey (Malden 2442).—Delay-action switches, emergency lighting units, jet starter switches, aircraft navigational flashing units, synchronous coders. **S.B.A.C. Stand 78.**

WAYMOUTH GAUGES AND INSTRUMENTS, LTD.—See under "Instruments."

WESTINGHOUSE BRAKE AND SIGNAL CO., LTD., 82, York Way, King's Cross, London, N.1 (Terminus 6432).—Lightweight metal rectifiers for aircraft power supplies. **S.B.A.C. Stand 140.**

AIRCRAFT INSTRUMENTS

(*And Instrument Servicing Equipment*)

BRYANS AEROQUIPMENT, LTD., Willow Lane, Mitcham, Surrey (Mitcham 1607).—Designers and manufacturers of aircraft instrument test equipment. Repairers of aircraft instruments. **S.B.A.C. Stand 51.**

FOSTER INSTRUMENTS CO., LTD.—See under "Factory and Airfield Equipment."

K.D.G. INSTRUMENTS, LTD., Purley Way, Croydon, Surrey (Thornton Heath 3868).—Aircraft instrument manufacturers.

KELVIN AND HUGHES (AVIATION), LTD., New North Road, Barkingside (Hainault 2601), and Winchester Road, Basingstoke (Basingstoke 690).—Navigational, flight and engine instruments, including sextants, compasses, turn-and-slip indicators, altimeters, synchroscopes, pressure gauges and air-speed indicators. (See also under "Instruments" in "Auxiliary Services" review preceding this directory.) **S.B.A.C. Stand 12.**

KENT, LTD., GEORGE, Luton, Bedfordshire (Luton 2440).—Aircraft fuel meters.

NEGRETTI AND ZAMBRA, LTD., 122, Regent Street, London, W.1 (Regent 3406).—Thermometers, pressure gauges (direct-reading and transmitting types), boost gauges, altimeters, torque meters, Pressure-operated switches, capsules and fuel-flow meters for aircraft.

PULLIN AND CO., LTD., R.B., Phoenix Works, Great West Road, Brentford, Middx. (Ealing 3661).—Electrical and electronic engineers. Scientific instrument designers and manufacturers. Specialists in gyroscopic apparatus.

REID AND SIGRIST, LTD., Braunstone, Leicester (Leicester 88101-4).—Aeronautical instruments; specialists in gyroscopic instruments. Test equipment, and electronic dynamic-balancing equipment.

SALFORD ELECTRICAL INSTRUMENTS, LTD., Silk Street, Salford, 3, Lancs. (Blackfriars 6688).—Instruments, relays, ultra-high-frequency apparatus, altimeters, specialized equipment for military aircraft. **S.B.A.C. Stand 17.**

SANGAMO WESTON, LTD., Enfield, Middlesex (Enfield 3434).—Weston electrical instruments for power indication, temperature and movement measurement and for use with navigational aids. **S.B.A.C. Stand 61.**

SHORT AND MASON, LTD.—See under "Works and Airfield Equipment."

SIMMONDS AEROCESSORIES, LTD.—See under "Aircraft Parts."

SMITHS AIRCRAFT INSTRUMENTS, LTD., Cricklewood, London, N.W.2 (Gladstone 3333).—A wide range of instruments, including the S.E.P.I. electric auto-pilot, electrical and mechanical flight and blind-flying instruments, gas-turbine equipment, pressure gauges, flowmeters, Smiths-Waymouth fuel contents gauges, etc. (See also in "Auxiliary Services" review preceding this directory.) **S.B.A.C. Stand 13.**

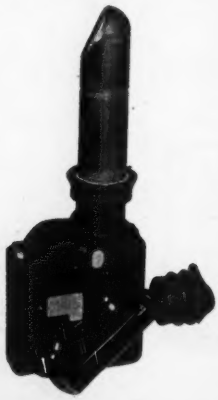
SPERRY GYROSCOPE CO., LTD., Great West Road, Brentford, Middlesex (Ealing 6771).—Gyroscopic flight instruments and automatic pilots, including gyro horizons, Gyrosyn compasses, Zero Reader and lightweight gyropilots. (See also under "Instruments" in "Auxiliary Services" review preceding this directory.) **S.B.A.C. Stand 106.**

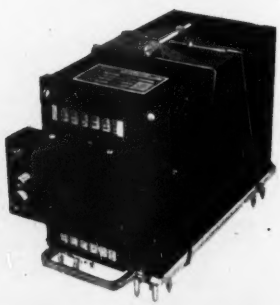
WAYMOUTH GAUGES AND INSTRUMENTS, LTD., Station Road, Godalming, Surrey (Godalming 1330).—Aircraft instruments and electrical equipment; dectrical relays and controls; telephone equipment. **S.B.A.C. Stand 14.**

WYNN AND CO., E. D., Staverton Aerodrome, Gloucester (Churchdown 3264).—A.I.D.- and A.R.B.-approved stockists of aircraft instruments and electrical accessories.

WYNSTRUMENTS, LTD., Staverton Aerodrome, Gloucester (Churchdown 3264).—A.R.B.-approved instrument laboratory for overhaul, modification, test and calibration of aircraft instruments.

(Left) Range of Venner ultra-lightweight accumulators. (Centre) Periscopic sextant by Kelvin and Hughes, Ltd. (Right) Plessey V.H.F. transmitter receiver for light aircraft.





LATEST POWER DEVELOPMENT FOR JET AIRCRAFT

THE SNARLER

rocket motor

At the S.B.A.C. Flying Display and Exhibition

will be seen for the first time the next

logical step in aircraft propulsion—the Snarler rocket motor

—designed and developed by Armstrong Siddeley

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SEPTEMBER 11 to 16

ARMSTRONG SIDDELEY MOTORS LIMITED
COVENTRY
Members of the Hawker Siddeley Group

YOU WILL NOT FIND THIS **STAND** AT FARNBOROUGH

BUT YOU WILL FIND US **STANDING** BY AT

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HEAD OFFICE

BOVINGDON

In addition, over 132,000 square feet of floor space is now available at Stansted Airport, Essex. This is the latest of our establishments, all of which are fully ARB and AID approved for complete overhaul of aircraft, and also radio and electrical components, C. of A.'s, charter, etc.

AVIATION TRADERS [ENGINEERING] LTD.

78 BUCKINGHAM GATE LONDON S.W.1.

THE ANCILLARY EQUIPMENT

CABIN EQUIPMENT
(*Other than Pressurization*)

AEROLEX LTD.—See under "Aircraft Parts."

ATTEWELL AND SONS, LTD., B.—See under "Aircraft Parts."

CONNOLLY BROS. (CURRIERS), LTD., Chalton Street, Euston Road, London, N.W.1 (Euston 1661).—Leather for seating, panelling and general furnishing of aircraft, including the Vaumol and Celstra brands of upholstery hides. **S.B.A.C. Stand 64.**

FIRTH AND SONS, LTD., T. F., Clifton Mills, Brighouse, Yorks (Brighouse 374-8).—Upholstery fabrics and carpeting for aircraft cabins. **S.B.A.C. Stand 10.**

GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2 (Temple Bar 8000).—Electrical equipment for passenger amenities in aircraft; airport lighting and electrification; aircraft cables. G.E.C. Heavy Alloy. **S.B.A.C. Stand 38.**

GODFREY AND PARTNERS, LTD., SIR GEORGE, Hampton Road, Hanworth Middlesex (Feltham 3291).—Pressurization and cooling equipment, air conditioning and pressure testing trolleys (see under "Auxiliary Services" review preceding this directory). **S.B.A.C. Stand 45.**

HAIRLOK CO., LTD., 117, Victoria Street, London, S.W.1 (Victoria 3511).—Rubberized hair filling for aircraft seats and upholstery. **S.B.A.C. Stand 6.**

KAPOK, LTD., North Acton Road, London, N.W.10 (Elgar 6868).—"Ceibatex" thermal- and sound-insulation blanket; sound-absorbent cabin linings.

LATEX UPHOLSTERY, LTD., 41, Lonsdale Road, London, W.11 (Bayswater 6262).—Aircraft seating, upholstery and trimming; Latex cushioning; cushion fillings. **S.B.A.C. Stand 3.**

MOSELEY AND SONS, LTD., DAVID, Chapelfield Works, Ardwick, Manchester, 12 (Ardwick 3341).—"Float-on-Air" interiors for seat cushions, etc.; rubber mouldings and extrusions.

PHOENIX TELEPHONE AND ELECTRIC WORKS, LTD., Sales office: 38, Newman Street, London, W.1 (Museum 4176). Works: Hendon, London, N.W.9.—"Phoenix" passenger-call luminous push-button signal systems and equipment, approved by M.O.S. and A.R.B.

R.F.D. CO., LTD.—See under "Military Aircraft Special Equipment."

RUMBOLD AND CO., LTD., L. A., Kingsgate Place, London, N.W.6 (Maida Vale 7366).—Specialists in aircraft interior equipment: seating, furnishing, soundproofing.

SCOTTISH AVIATION, LTD.—See under "Miscellaneous."

SORBO, LTD.—See under "Materials."

TENAPLAS (SALES), LTD.—See under "Aircraft Parts."

TINKERTEX, LTD., Holmfirth, near Huddersfield (Holmfirth 636-7).—Manufacturers of fireproof and moth-proof upholstery fabrics, curtaining and aircrew uniform cloths.

VICKERS-ARMSTRONGS, LTD., Vickers House, Broadway, London, S.W.1 (Abbey 7777).—Airliner seating, galley and toilet equipment. **S.B.A.C. Stand L.**

WARERITE, LTD., Ware, Herts.—Decorative laminated plastics for air craft tables, etc. (Unit of Bakelite, Ltd.)

WRIGHT AND SON (VENEERS), LTD., JOHN.—See under "Materials."

(Above) G.Q. Type ZD pilot safety harness as used in Vickers-Supermarine Attacker, Gloster Meteor and other aircraft. (Right) The largest of the many R.F.D. products—a paratroop training balloon, with truck-mounted winch.

MILITARY-AIRCRAFT SPECIAL EQUIPMENT
(*Including Armament, Gunnery-training Devices, Ejector Seats, etc.*)

AIR TRAINERS, LTD.—See under "Miscellaneous."

FERRANTI, LTD.—See under "Electrical."

M. L. AVIATION CO., LTD., White Waltham Aerodrome, Maidenhead (Littlewick Green 248).—Gunsight retractable mountings, target-towing equipment, air-cooling units, pilot-ejection seats, pressure-cabin signal pistols. (See also under "Auxiliary Services" review preceding this directory.) **S.B.A.C. Stand 71.**

M. L. ENGINEERING CO., LTD., United Building Trading Estate, Slough (Slough 23838).—Gunsight retractable mountings, target-towing equipment, ground and flight mobile air-cooling units, pressure-cabin signal pistols, airfield equipment. (See also under "Auxiliary Services" review preceding this directory.)

MARTIN-BAKER AIRCRAFT, LTD., Denham, Middlesex (Denham 2214).—Ejector seats, gun feeds and mountings, etc. (See under "Auxiliary Services" review preceding this directory.)

R.F.D. CO., LTD., Catteshall Lane, Godalming, Surrey (Godalming 1441-1445).—Rescue equipment (see under "Emergency Equipment" in "Auxiliary Services" review preceding this directory.)

SALFORD ELECTRICAL INSTRUMENTS, LTD.—See under "Instruments."

TRIPLEX SAFETY GLASS CO., LTD.—See under "Materials."

PARACHUTES, DINGHIES AND EMERGENCY EQUIPMENT
(*Other than Fire Protection*)

AIRCRAFT MATERIALS, LTD.—See under "Aircraft Parts."

FRANKENSTEIN AND SONS, (MANCHESTER), LTD., P., Victoria Rubber Works, Newton Heath, Manchester, 10 (Failsworth 1166).—Life-saving clothing; fireproof coverings for fuel tanks. (See under "Auxiliary Services" review preceding this directory.) **S.B.A.C. Stand 161.**

G.Q. PARACHUTE CO., LTD., Stadium Works, Woking, Surrey (Woking 2277).—All types of man-dropping and supply-dropping parachute; brake and anti-spin parachutes; Type "Z" aircrew safety harnesses (see also "Auxiliary Services" review preceding this directory). **S.B.A.C. Stand 1.**

IRVING AIR CHUTE OF GREAT BRITAIN, LTD., Letchworth, Herts (Letchworth 888).—Parachutes for all types of Service aircraft and airborne troops, and for gliding, supply-dropping, etc.; automatic baroelectric-release devices. (See also under "Emergency Equipment" in "Auxiliary Services" review preceding this directory.) **S.B.A.C. Stand 35.**

PERMUTIT CO., LTD., THE, Permutit House, Gunnersbury Avenue, London, W.4 (Chiswick 6431).—Emergency desalting kits for producing drinking water from sea-water.

SCHERMULY PISTOL ROCKET APPARATUS, LTD.—See under "Miscellaneous."

SIEBE, GORMAN AND CO., LTD.—See under "Miscellaneous."

SPARKLETS, LTD.—See under "Aircraft Parts."

Y.S.C., LTD., THE.—See under "Aircraft Parts."

An Esso refueller ministers to a U.S.A.C. Douglas C-24 on an English airfield.

G.E.C. 3kW air-circulation oven for the Comet's galley.

THE ANCILLARY INDUSTRY . . .

FUELS AND OILS

(*Including Special-purpose Fluids; Refuelling Equipment*)

AIRCRAFT MATERIALS, LTD.—See under "Aircraft Parts."

ANGLO-IRANIAN OIL CO., LTD., Aviation Department, Britannic House, Finsbury Circus, London, E.C.2 (Central 7422).—See Shell-Mex and B.P., Ltd. **S.B.A.C. Stand 93.**

AVERY EQUIPMENT, LTD.—See under "Aircraft Parts."

BAWN AND CO., LTD., W.B.—See under "Aircraft Parts."

DICK AND CO., LTD., W. B., 43, Grosvenor Street, London, W.1 (Grosvenor 6050).—Lubricating oils and greases to D.T.D. specifications, "Dixol" soluble and "Ilocut" cutting and broaching oils; corrosion preventives, A.I.D.- and C.C.I.-approved.

ESSO PETROLEUM CO., LTD., Aviation Dept., Artillery House, London, S.W.1 (Abbey 4882).—Refiners and world-wide distributors of Esso aviation fuels, oils and lubricants. **S.B.A.C. Stand 88.**

EXACTOR, LTD.—See under "Aircraft Parts."

FLETCHER MILLER, LTD., Alma Mills, Hyde, near Manchester (Hyde 781).—Cutting fluids, aircraft engine and instrument lubricants for extreme operational conditions, hydraulic fluids, corrosion preventives, degreasing fluids to D.T.D. specifications.

FLIGHT REFUELLING, LTD., Tarrant Rushton Airfield, near Blandford, Dorset (Blandford 501).—Refuelling equipment for aircraft: valves; float switches; pipe connectors; couplings; flight refuelling equipment by probe and drogue system. **S.B.A.C. Stand 176.**

PRICE'S LUBRICANTS, LTD., Belmont Works, London, S.W.11 (Battersea 2000).—Manufacturers of lubricating oils and greases (approved inspection under A.I.D. and A.R.B.).

ROSALEX, LTD., 10 Norfolk Street, Manchester 2.—"Barrier" preparations for the protection of the skin of persons engaged in industrial processes.

SHELL-MEX AND B.P., LTD., Shell-Mex House, Strand, London, W.C.2 (Temple Bar 1234).—Distributors for the Shell and Anglo-Iranian Oil groups. **S.B.A.C. Stand 92.**

SHELL CHEMICALS, LTD., 105-109, Strand, London, W.C.2 (Temple Bar 4455).—"Teepol" liquid detergent for maintenance of aircraft, cleaning of buildings, and washing-up in canteens or galleys; Shell V.P.I. 260 vapour-phase corrosion-inhibitor for preservation during storage.

TECALEMIT, LTD., Great West Road, Brentford, Middx. (Ealing 6661).—"Micro" pump for lubrication of mainshaft bearings; lubricating hand-guns and nipples; "Tecalemeters" for the precise measurement of liquids. **S.B.A.C. Stand 131.**

VACUUM OIL CO., LTD., Caxton House, London, S.W.1 (Whitehall 1010).—Mobiloil Aero engine oils, Mobil hydraulic oils, fluids, and specialties; Mobilgrease aero greases.

VOSPER, LTD.—See under "Miscellaneous."

WAKEFIELD AND CO., LTD., C. C., 46, Grosvenor Street, London, W.1 (Mayfair 9232).—Castrol aircraft and motor oils and greases; lubricating plant and servicing equipment.

ZWICKY, LTD., Slough Trading Estate, Slough, Bucks (Slough 23732).—Manufacturers of pumps, filters, airfield refuelling units, and refuelling equipment of all descriptions.

PAINTS AND FINISHES

(*Including Protective Processes*)

ALUMILITE AND ALZAK, LTD., Station Road, London, S.W.19 (Liberty 7641).—Decorative and anti-corrosive finishes, A.I.D. and A.R.B.-approved.

CELLON, LTD., Kingston-on-Thames, Surrey (Kingston 1234).—Manufacturers of a complete range of protective coatings for aircraft to current A.I.D. and A.R.B. specifications; also Cellon pre-treatment primer, Cerric cellulose lacquers, Cerrux synthetic finishes. **S.B.A.C. Stand 101.**

DOCKER BROTHERS, Ladywood, Birmingham, 16 (Edgbaston 4111).—Aircraft finishing materials to D.T.D. and A.R.B. requirements; protective and decorative finishes for airport buildings, transport and ground servicing equipment. **S.B.A.C. Stand 30.**

HADFIELDS (MERTON), LTD., Western Road, Mitcham, Surrey (Mitcham 2234).—Paints, varnishes and enamels of all types. "Duramej" solventless and thermo-setting insulating varnishes.

HALL AND SONS, LTD., JOHN, St. Pancras Way, London, N.W.1 (Euston 2262), and Hengrove, Bristol, 4.—Paints, varnishes, dopes, lacquers, etc., to aircraft specifications and for airfield-building interior and exterior decoration. **S.B.A.C. Stand 67.**

I.C.I. PAINTS DIVISION, Slough, Bucks (Slough 23851).—Full range of aircraft finishes to A.I.D. and A.R.B. requirements. Etch primer; fire-resisting clear and coloured dopes; Aero "Du-Lite"; one-coat synthetic white exterior finish; "Alocrom" pre-treatment for aluminium. **S.B.A.C. Stand 160.**

JENOLITE, LTD., 43, Piazza Chambers, Covent Garden, London, W.C.2 (Temple Bar 1745).—Jenolite "AC" aluminium cleaner and degreaser for aircraft; rust-removers, keying solution, degreasers, paint strippers, stainless-steel de-scaler, Jenolite black-finish process. **S.B.A.C. Stand 85.**

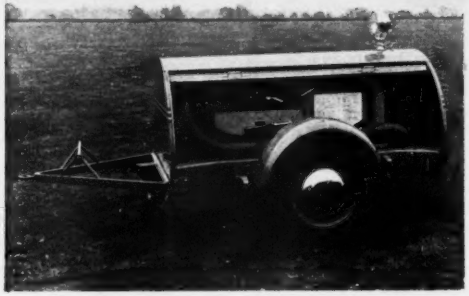
METALLISATION, LTD., Barclays Bank Chambers, Dudley (Dudley 3321).—Metal-spraying of all aircraft components and suppliers of plant for metal-spraying.

PAINT REMOVERS, LTD., 24, Ryder Street, London, S.W.1 (Trafalgar 4161).—Paint-removing preparations, including water-washable, non-inflamable "Offkwik."

RYLAND, LTD., LLEWELLYN, Balsall Heath Works, Birmingham, 12 (Calthorpe 2284-6).—Aircraft protective and decorative coatings, cellulose dopes and lacquers, oil primers and synthetic finishes, seaplane varnish, "Durslac" jointing compound, stoving enamels, paint removers. **S.B.A.C. Stand 43.**

SCHORI METALLISING PROCESS, LTD., Brent Crescent, London, N.W.10 (Elgar 7393).—Flame-sprayed metal and plastic coatings for protection, insulation, electrical contact, etc.

TITANINE, LTD., Colindale, London, N.W.9 (Colindale 8123).—Makers of aircraft finishes since 1914. Approved high-speed, lightweight, white-top, pre-treatment primer, radome and stoving schemes; "Redovar" paint stripper and "Temprolac" T.P.6. **S.B.A.C. Stand 154.**



The Mk IV airliner toilet-servicing unit, designed by Air Service Training.

FACTORY AND AIRFIELD EQUIPMENT

(*Machinery; Servicing and Test Equipment*)

ABINGDON KING DICK, LTD., Abingdon Works, Kings Road, Tyseley, Birmingham (Acocks Green 2881).—Hand tools and special spanners for engine service and overhaul.

AERO CONTROLS, LTD.—See under "Aircraft Parts."

AIR INDUSTRIAL DEVELOPMENTS, LTD., Shenstone, near Lichfield, Staffs (Shenstone 341).—Manufacturers of compressors, spray-painting and industrial finishing equipment, dry-backed and water-wash spray booths.

AIR SERVICE TRAINING, LTD.—See under "Miscellaneous" heading.

AIRCRAFT MATERIALS, LTD., Midland Road, London, N.W.1 (Euston 6151).—Hand- and power-operated tools and rivets for "Pop" riveting; rivet-spinning tools; pipe-flaring tools. **S.B.A.C. Stand 52.**

AMAL, LTD.—See under "Aircraft Parts."

AVIATION DEVELOPMENTS, LTD., 229-231, High Holborn, London, W.C.1 (Chancery 8601).—Chobert Blind rivets and riveting equipment; "Avdel" self-sealing blind rivets and equipment; "Pip" quick-release positive-lock shear-pins; "Avdel" sheet grippers; close-tolerance and solid machined rivets. **Stand No. 169.**

BARNARDS, LTD., Norfolk Iron Works, Norwich (Norwich 20554).—Aircraft ground equipment, including passenger landing steps, baggage trucks, maintenance platforms, maintenance rostra, and refuelling ladders.

BIFURCATED AND TUBULAR RIVET CO., LTD., Aylesbury, Bucks (Aylesbury 1044).—Manufacturers of bifurcated, tubular and semi-tubular rivets in all materials; manufacturers of foot- and power-operated automatic-feed rivet-setting machines, including flush-riveting types.

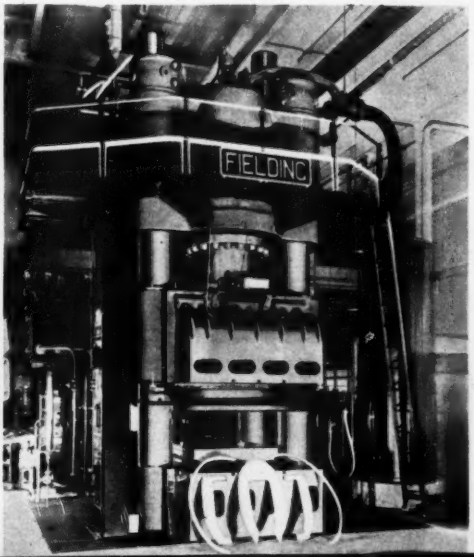
BLACK AND DECKER, LTD., Harmondsworth, Middlesex (West Drayton 2681-7).—Manufacturers of portable electric tools and valve and valve-seat grinding equipment.

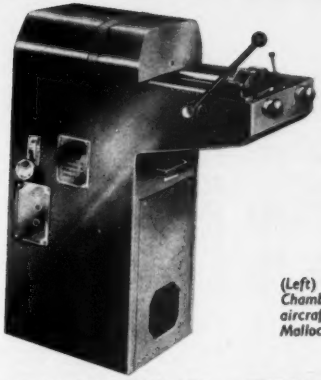
BRITISH ERMETO CORPORATION, LTD., Beacon Works, Hargrave Road, Maidenhead, Berks (Maidenhead 2271).—Ermeto couplings for all pressures up to 20,000 lb/sq in, as used on test-bed equipment by aircraft and aircraft-component manufacturers. **S.B.A.C. Stand 144.**

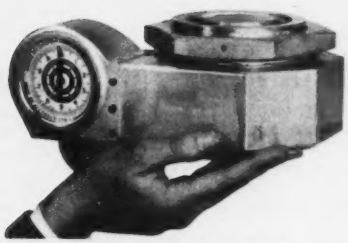
BRITISH INSULATED CALLENDER'S CABLES, LTD., Norfolk House, Norfolk Street, London, W.C.2 (Museum 1600).—Electric cables for airport installations; Callender-Hamilton hangars. **S.B.A.C. Stand 50.**

BROOM AND WADE, LTD., High Wycombe, Bucks (High Wycombe 1630).—Air compressors and pneumatic tools for civil and mechanical engineering, including aircraft construction, foundry work, etc.

Large hydraulic sheet-metal-forming press: one of the range as supplied to the aircraft industry by Fielding and Platt, Ltd.







(Left) "Staffa" 4in single-spindle screwing machine, by Chamberlain Industries, Ltd. (Centre) B.O.A.C. Hydrostatic aircraft-weighing machine (Kenton Equipment, Ltd.). (Right) Mallock-Armstrong ear-defenders for test-plant duties.

BROWN TRACTORS, LTD., DAVID, Meltham, near Huddersfield, Yorks (Meltham 361).—Taskmaster medium industrial tractor for aircraft hauling and loading, and for general airfield service. **S.B.A.C. Stand 158.**

BROWN BROTHERS (AIRCRAFT), LTD.—See under "Aircraft Parts."

CAPE ASBESTOS CO., LTD.—See under "Materials."

CARTER AND CO., LTD., B. AND F., Albion Works, Bolton, Lancs (Bolton 4344-6).—Ratchet and revolution counters, pre-determined counters, hand tally counters, speed indicators, counters for coil-winding machines, electro-magnetic counters.

CENTRAL REDIFFUSION SERVICES, LTD., Carlton House, Lower Regent Street, London, S.W.1 (Whitehall 0221).—Sound amplification systems, including staff location and "Music While You Work" for industry. Responsible for public address system, S.B.A.C., Farnborough, 1951.

CHAMBERLAIN INDUSTRIES, LTD., Staffa Road, London, E.10 (Leytonstone 3678).—Wide range of standard and special-purpose light machinery; transportable, easily erected buildings.

CHURCHILL MACHINE TOOL CO., LTD., Broadheath, near Manchester (Altrincham 3262).—All types of precision grinding machines for the manufacture of engines, airframes and major components.

CLECO ELECTRIC INDUSTRIES, LTD., Foundry Square, Leicester (Leicester 60774 and 22183).—Manufacturers of electric-powered high- and low-lift fork, pallet and stillage trucks; battery charging apparatus; electric arc welders.

CLICO, LTD., Meadow Works, Meadow Street, Sheffield, 3 (Sheffield 26504).—Specialists in router cutters for Wadkin and other routing machines.

CONSOLIDATED PNEUMATIC TOOL CO., LTD., 332, Dawes Road, London, S.W.6 (Fulham 7722).—Air compressors and portable power tools (pneumatic and electric), and "Hicycle" electric tools, for aircraft construction.

COVENTRY CLIMAX ENGINES, LTD., Widdrington Road, Coventry (Coventry 5051).—Petrol and diesel fork-lift trucks, trailer fire-pumps, generating sets.

CURRAN, LTD., JOHN, Curran Road, Cardiff (Cardiff 44431).—Performance-testing equipment for all types of piston and gas-turbine aircraft engines. **S.B.A.C. Stand 139.**

DAWE INSTRUMENTS, LTD., 130, Uxbridge Road, Hanwell, London, W.7 (Ealing 6215).—Electronic measuring instruments, stroboscopes, sound- and vibration-measuring equipment, dynamic-balancing machines, moisture-in-timber meters, etc. A.I.D. approved.

DELANEY GALLAY, LTD.—See under "Aircraft Parts."

DESOUTTER BROTHERS, LTD. DESOUTTER BROTHERS, LTD., The Hyde, Hendon, London, N.W.9 (Colindale 6346-9).—Portable pneumatic and electric tools for aircraft assembly and construction. **S.B.A.C. Stand 82.**

DUNLOP AND RANKEN, LTD., 147, The Headrow, Leeds, 1 (Leeds 27301).—Steel-framed hangars and general constructional steelwork for buildings, aircraft jigs, racks; also fuel tanks.

ENGLISH STEEL CORPORATION, LTD.—See under "Aircraft Parts."

ESAVIAN, LTD., Esavian Works, Stevenage, Herts (Stevenage 500).—Tractable hangar doors of large dimensions in aluminium, electrically operated.

EVERSHED AND VIGNOLES, LTD.—See under "Aircraft Parts."

EXACTOR, LTD.—See under "Aircraft Parts."

FIELDING AND PLATT, LTD., Hydraulic Engineers, Atlas Works, Gloucester (Gloucester 20351).—Designers and manufacturers of hydraulic presses for the production of sheet metal components for the aircraft and automobile industries.

FIRTH BROWN TOOLS, LTD., Speedicut Works, Carlisle Street East, Sheffield, 4 (Sheffield 27151).—Engineers' cutting tools of all types.

FLEXIBLE DRIVES (GILMANS) LTD., 195, High Street, Smethwick, (Smethwick 1302-5).—Flexible-drive machines, flexible drives, rotary milling cutters and files. **S.B.A.C. Stand 164.**

FLIGHT REFUELLING, LTD.—See under "Fuel and Oils."

FOSTER INSTRUMENTS CO., LTD., Letchworth, Herts (Letchworth 984).—Industrial instruments, including electronic, moving coil, radiation and optical pyrometers (recording, indicating and controlling), and introscopes, for internal inspection of inaccessible parts.

GENERAL ELECTRIC CO., LTD.—See under "Cabin Equipment."

GREEN AND SON, LTD., THOMAS, Smithfield Ironworks, Leeds, 2 (Leeds 20357).—Gang mowers and power-driven rollers for use on airfields.

HEENAN AND FROUDE, LTD., Worcester (Worcester 3391).—Test plants for aircraft engines, including wind tunnel plants, hangar stands, stationary wings (engines or airscrews), turbojet and turboprop test plants, etc.

ALFRED HERBERT, LTD., Coventry. Head Works, Edgwick (Coventry 88781); Factored Division, Red Lane (Coventry 89221).—Machine tools and production equipment for the aircraft industry.

HORDERN-RICHMOND, LTD., Hy-du-lignum Works, Haddenham, Bucks (Aylesbury 1100).—"Hy-du-lignum" rubber press dies, Hufford and other types of stretch-press tools, router templates, drill jigs. Aeromatic airscrews, variable-pitch blades, helicopter rotor blades, fixed-pitch airscrews. (See also under "Auxiliary Services" review preceding this directory.) **S.B.A.C. Stand 136.**

HYMATIC ENGINEERING CO., LTD.—See under "Aircraft Parts."

I.T.D., LTD., 95-99, Ladbroke Grove, London, W.11 (Park 8070).—Materials-handling equipment; "Stacatruc" and "Aerolift" fork-lift trucks and "Electricar" industrial trucks with fixed and elevating platforms.

JENKS BROTHERS, LTD., Britool Works, Bushbury, Wolverhampton (Wolverhampton 31281).—Socket-wrench equipment and ring wrenches in English, American, metric and unified sizes; specialized hand tools; fixed and adjustable torque wrenches.

KENTON EQUIPMENT, LTD., 48, Brook Street, London, W.1 (Mayfair 3747).—Sole world distributors of B.O.A.C. hydrostatic aircraft-weighing unit manufactured by Alltools, Ltd. (to be displayed at Farnborough on stand of Skyhi, Ltd., No. 124).

LEYTONSTONE JIG AND TOOL CO., LTD., Leytool Works, High Road, Leyton, London, E.10 (Leytonstone 5022), and at Patcham, Sussex.—Jigs, fixtures, press tools, gauges and moulds for the aircraft industry; also Leytool hand drills, breast drills, ratchet spanners, hacksaws, screwdrivers, socket sets and universal spanners.

M.L. ENGINEERING CO., LTD.—See under "Military Aircraft Special Equipment."

McMICHAEL RADIO LTD.—See under "Electrical."

MALLOCK-ARMSTRONG CO., 39, Victoria Street, London, S.W.1 (Abbey 7113).—"Noisonic" ear-defenders for those engaged in the testing of engines, including gas turbines; new Mk 11 type weighing only 7 oz.

MARBAIX, LTD., GASTON E., Devonshire House, Vicarage Crescent, London, S.W.11 (Battersea 8888).—Concessionaires for a wide variety of production equipment of interest to the aircraft industry, including special-purpose machine tools and optical inspection equipment.

MASSON SEELEY AND CO., LTD.—See under "Aircraft Parts."

MEK-ELEK ENGINEERING, LTD., 17, Western Road, Mitcham, Surrey (Mitcham 3072).—Adjustable local lighting units for machine tools, fitters' benches, etc.

MERCURY TRUCK AND TRACTOR CO., LTD., 19, London Road, Gloucester (Gloucester 22025).—Diesel and petrol aircraft-towing tractors; trucks and tractors for baggage and freight handling.

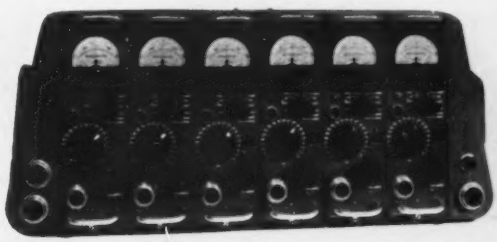
METALLISATION, LTD.—See under "Paints and Finishes."

MOLLART ENGINEERING CO., LTD., Kingston By-pass, Surbiton, Surrey (Elmbridge 3352).—Prototype aircraft assemblies, Air Ministry approved universal joints. Plain and screw ring and plug gauges. Air Ministry Gauge Test House Authority 89755/51. **S.B.A.C. Stand 62.**

MORRIS, LTD., B. O., Morrisflex Works, Stoke, Coventry (Coventry 5081).—Rotary files, cutters and wire brushes; flexible-shaft equipment; tools specially developed for turbine-blade finishing.

MUREXWELDING PROCESSES, LTD., Waltham Cross, Herts (Waltham Cross 3636).—Engine-driven ground power units for servicing and starting all types of aircraft, including piston engines, turbojets and turboprops. **S.B.A.C. Stand 83.**

MURPHY RADIO, LTD.—See under "Electrical."



(Left) Dawe Instruments, Ltd., stroboscope set up for single-flash photography. (Right) Strain-gauge amplifier equipment by McMichael, Radio *(see p. 331).*

THE ANCILLARY INDUSTRY . . .

Factory and Aircraft Equipment (continued) . . .

POLES, LTD., Tyburn Road, Birmingham, 24 (Erdington 1616).—"Adastra" lighting columns for airfields and roads. Transmission poles, telegraph and telephone lines, flagpoles and radio masts.

PYE, LTD.—See under "Electrical."

R.F.D. CO., LTD.—See under "Military Aircraft Special Equipment."

RANSOMES SIMS AND JEFFERIES, LTD., Ipswich (Ipswich 2201).—Gang mowers for cutting grass on airfields.

REDIFON LTD. (flight simulators and trainers).—See under "Electrical."

REID AND SIGRIST, LTD.—See under "Aircraft Instruments."

ROSS, LTD., S. GRAHAME.—See under "Aircraft Parts."

SAVAGE AND PARSONS, LTD.—See under "Electrical."

SCHORI METALLISING PROCESS, LTD.—See under "Paints and Finishes."

SHEFFIELD TWIST DRILL AND STEEL CO., LTD., Summerfield Street, Sheffield (Sheffield 24137).—High-speed steel twist drills, reamers and engineers' small tools.

SHORT AND MASON, LTD., Aneroid Works, Hale End Road, Walthamstow, London E.17 (Larkswood 3371).—Airfield instruments and meteorological instruments.

SIEMENS ELECTRIC LAMPS AND SUPPLIES, LTD., 38-39, Upper Thames Street, London, E.C.4 (Central 2332) and Preston, Lancs.—Lighting engineers; electric lamps of all types.

SKYHI, LTD., Skyhi Works, Worton Road, Isleworth, Middx. (Hounslow 2211).—Hydraulic aircraft jacks, transportation gear, "Tracjacs" and aircraft skates; inhibitor spray guns; "Skyflex" high-pressure hose units and couplings. **S.B.A.C. Stand 124.**

TALBOT TOOL CO., LTD., Grip Works, Brighton (Brighton 55832).—Aircraft drill bushes and Talbot Blue marking-out fluid.

TAYLOR (BIRMINGHAM) LTD., CHARLES, Bartholomew Street, Birmingham, 5 (Midland 0083-5).—Machine-tool makers and manufacturers of the Taylor Chuck.

TILTMAN LANGLEY LABORATORIES, LTD.—See under "Miscellaneous."

TURNER BROTHERS (BIRMINGHAM), LTD., Galvanic Works, Cleveland Street, Birmingham, 19 (Aston Cross 1741).—Press tools, jigs and fixtures, moulds and dies, power presses and pressings for the aircraft and allied industries.

UNDERWOOD CONSTRUCTION, LTD., Argall Avenue, London, E.10 (Leyton 6968).—Steel buildings and hangars.

VAN DORN ELECTRIC TOOLS, LTD., Harmondsworth, Middlesex (West Drayton 2681-7).—Portable electric tools, including sanders, screwdrivers, drills, valve and seat refacers, bench and portable grinders, etc.

VAN MOPPES AND SONS (DIAMOND TOOLS) LTD., L. M., Basingstoke, Hants (Basingstoke 1240).—Diamond tools and diamond powders of all types for use in the aircraft industry.

VINTEN, LTD., W.—See under "Miscellaneous."

WICKMAN, LTD., Coventry (Tile Hill 66271).—Machine tools and Wimet-tipped tools and wear-resistant parts.

WILD-BARFIELD ELECTRIC FURNACES, LTD., Elecfurn Works, Watford By-Pass, Watford, Herts. (Watford 6094).—Electric furnaces for all heat-treatment purposes; induction heating equipment.

WOLF ELECTRIC TOOLS, LTD., Hanger Lane, London, W.5 (Perivale 5631).—Portable electric tools, including drills, sanders, screwdrivers, nutsetters, blowers, chisel mortisers, saws and hammers; hand, bench, pedestal, flexible-shaft and lathe grinders.

MISCELLANEOUS

AEROCONTACTS, LTD., Gatwick Airport, Horley, Surrey (Horley 1510).—A.I.D. and A.R.B. approved stockists of aircraft components and accessories; radio and electrical servicing; aircraft overhaul and repair; aeronautical consultants.

AERONAUTICAL RADIO SERVICES, LTD., Blackbushe Airport, Camberley, Surrey (Camberley 1600, Ex. 80).—Service and maintenance of aircraft radio and radar equipment; inspection and overhauls; C. of A. requirements; radio consultants, and stockists of aircraft radio spares. A.R.B. and A.I.D. approved.

AEROSERVICES (LONDON), LTD., 31, Clarges Street, London, W.1 (Grosvenor 7378).—Aircraft brokers.

AIR SERVICE TRAINING, LTD., Aircraft Division, Hamble, Southampton (Hamble 2185).—Maintenance of landplanes and flying boats, aircraft servicing equipment, component manufacture, gas-turbine installation research. Training Division: Schools of flying, radio, radar, navigation and engineering.

AIR TRAINERS, LTD., Cubitts Works, Bicester Road, Aylesbury, Bucks (Aylesbury 922-3).—Licencees and manufacturers of the Link Trainer and other devices for instruction in piloting and navigation. **S.B.A.C. Stand 117.**

AIRWORK, LTD., 15, Chesterfield Street, London, W.1 (Grosvenor 4841).—Air transport contracting; repair, maintenance and conversion of aircraft; sale and purchase; operation and managing of schools and clubs; radio sales and service; aviation insurance. **S.B.A.C. Stand 99.**

ANCILLARY DEVELOPMENTS, LTD., Blackbushe Airport, Camberley, Surrey (Camberley 1437/8).—Overhaul of all aircraft flight instruments and electrical and hydraulic equipment. A.I.D. and A.R.B. approved.

ANTIFYRE, LTD., Shaftesbury Road, London, W.3 (Acorn 1166).—Fire-protection equipment, including Antifyre Model IIIB Pistole extinguisher, A.R.B.-approved, for dealing with cabin fires, etc.

AVIATION TRADERS, LTD., Southend-on-Sea Airport, Essex, and 78, Buckingham Gate, London, S.W.1 (Whitehall 0056).—C. of A. overhauls (at Southend, Stansted and Bovingdon); aircraft spares.

BAXTER, WOODHOUSE AND TAYLOR, LTD., Woodside, Poynton, Cheshire (Poynton 2261).—Electrically heated flying clothing. (See also under "Aircraft Parts.")

BRAND AND CO., LTD., R. A., "Cocoon" Division, Field House, Breams Buildings, Chancery Lane, London, E.C.4 (Chancery 2381).—"Cocoon" plastic spray packaging for the protection of equipment during storage or shipment. **S.B.A.C. Stand 107.**

COLLEGE OF AERONAUTICAL AND AUTOMOBILE ENGINEERING, Sydney Street, London, S.W.3 (Flaxman 0021).—Practical and theoretical training for careers in aviation.

E.M.I. INSTITUTES, 43, Grove Park Road, London, W.4 (Chiswick 4417).—Technical training courses.

EXPORT PACKING SERVICE, LTD., 6, Broad Street Place, London, E.C.2 (London Wall 4237 and 4386).—Specialists in aircraft pre-packaging and packing for export. **S.B.A.C. Stand 162.**

FELTHAM AND SON, LTD., WALTER H., Imperial Works, Tower Bridge Road, London, S.E.1 (Hop 1784-5).—Cotton bags for spare parts, tube-end covers, etc.

FIELD AIRCRAFT SERVICES, LTD., Croydon Airport (Croydon 7777).—Aircraft, engine, airscrew and instrument overhauls, service and sales; aircraft conversions; specialists on Pratt and Whitney 1830 series. Works: Croydon, Bovingdon, Tollerton.

FLIGHT REFUELLING, LTD.—See under "Fuel and Oils."

GIEVES, LTD., 27, Old Bond Street, London, W.1 (Regent 2276).—Specialists in all types of uniform, badges and buttons; designs submitted without obligation to airlines, clubs, etc.; flying clothing.

GRAVINER MANUFACTURING CO., LTD.—See under "Fire Prevention" in "Auxiliary Services" review preceding this directory.

ILFORD, LTD., Ilford, London (Ilford 3000).—Manufacturers of sensitized photographic materials and accessories.

LANCASHIRE AIRCRAFT CORPORATION, LTD., 11, Berkeley Street, London, W.1 (Mayfair 2981).—Independent air-transport operators of York, Halton, Consul, Rapide, Proctor and Auster aircraft at London, Blackpool, Leeds and Newcastle. A.R.B. and A.I.D. approved for airframe, engine and radio maintenance and overhaul.

LEP TRANSPORT, LTD., 37, Upper Thames Street, London, E.C.4 (Central 5050).—Aircraft packers and shippers. Specially designed cases and cartons for aircraft components and examples of tropical packing. Approved packers by A.I.D., I.E.M.E., C.I.S. and Admiralty. **S.B.A.C. Stand 46.**

LEWIS, LTD., D., 124, Great Portland Street, London, W.1 (Museum 4314).—Flying clothing, including suits, boots, helmets, goggles, intercommunication equipment; oxygen masks and tubes; life-saving jackets; all to R.A.F. specifications.

MAGALOW TRADING CO., 27-39, Broadley Terrace, Lisson Grove, London, N.W.1 (Ambassador 7013).—Stockists of British and American aircraft ancillary equipment and ground equipment; stockists of A.G.S. and other aircraft parts.

PARK, LTD., R. AND J., 143-9, Fenchurch Street, London, E.C.3 Mansion House 3083).—Aircraft shippers and packers. **S.B.A.C. Stand 2.**

PEST CONTROL, LTD., Bourn, Cambridge (Harston 312).—A.R.B.-approved for helicopter C. of A. overhauls; makers of detail parts and sub-assemblies.

PYRENE CO., LTD.—See under "Fire Prevention" in "Auxiliary Services" review preceding this directory.

ROLLASON, LTD., W. A., Croydon Airport, Surrey (Croydon 5151-4).—Aeronautical contractors and consultants; experimental engineers; aircraft sales, service, maintenance, etc.; airframe and engine spares. Stockists. A.R.B.- and A.I.D.-approved.

ROLLASONS ENGINES LTD., Croydon Airport, Surrey (Croydon 5151-4).—Engines bought, sold and exchanged; engine overhaul and modification; spares and ancillaries. Experimental engineers. A.R.B.- and A.I.D.-approved.

SCHERMULY PISTOL ROCKET APPARATUS, LTD., THE, Newdigate, Surrey (Newdigate 331-3).—Pyrotechnic landing and reconnaissance flares, high-altitude parachute signals, dinghy distress signals, smoke-flame floats, Very pistols and cartridges. (See also under "Emergency Equipment" in "Auxiliary Equipment" review preceding this directory.) **S.B.A.C. Stand 60.**

SCHOOL OF GAS TURBINE TECHNOLOGY, Farnborough Place, Farnborough, Hants (Farnborough 1300).—Courses in the theory and practice of gas turbines; under the ægis of Power Jets (Research and Development), Ltd.

SCOTTISH AVIATION, LTD., Prestwick Airport, Prestwick, Ayrshire (Prestwick 7272).—Aircraft designers and constructors; seating and furnishing equipment; aircraft conversions and overhauls; airline operators (Scottish Airlines). **S.B.A.C. Stand 127.**

SIEBE, GORMAN AND CO., LTD., Neptune Works, Davis Road, Tolworth, Surbiton, Surrey (Elmbridge 5900).—Oxygen breathing apparatus for crew and passengers; safety harness for military and civil aircraft; test apparatus; life-saving waistcoats; servicing air compressors. (See also under "Auxiliary Services" review preceding this directory.) **S.B.A.C. Stand 110.**

STARAVIA, Blackbushe Airport, Camberley, Surrey (Camberley 1600).—British and American ground, overhaul and test equipment; aircraft spares and ancillaries; Dakota spares specialists.

TINKERTEX, LTD.—See under "Cabin Equipment."

TILTMAN LANGLEY LABORATORIES, LTD., Redhill Aerodrome, Surrey (Nutfield Ridge 2232).—Aeronautical research and development engineers. **S.B.A.C. Stand 108.**

VINTEN, LTD., W., North Circular Road, London, N.W.2 (Gladstone 6373).—Cinematograph equipment; instrumentation and take-off (F.47) cameras.

VOSPER, LTD., Portsmouth (Cosham 75281).—Air-sea rescue craft, refuelling launches, seaplane tenders, firefloats, airborne lifeboats and similar craft.

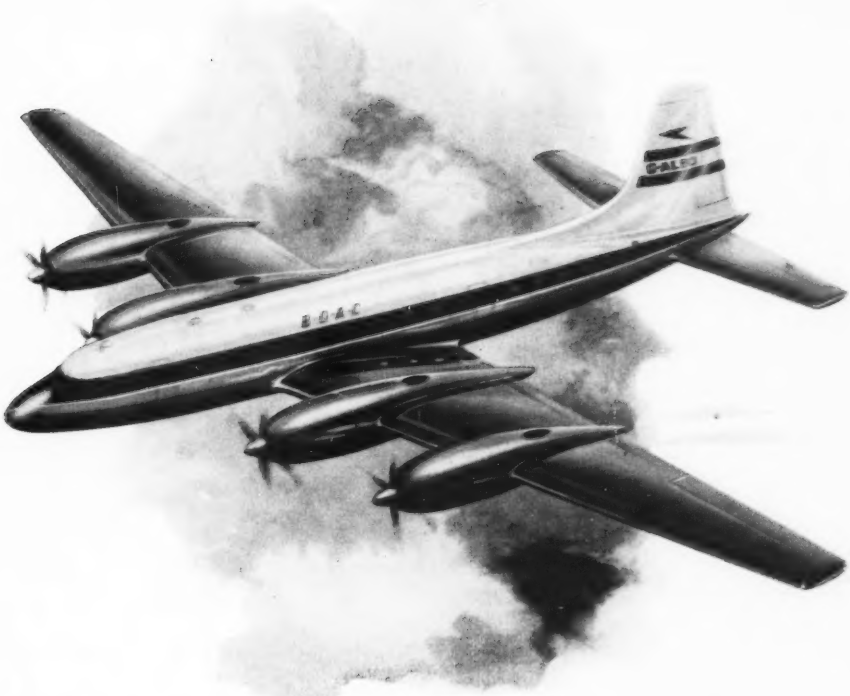
WILLIAMSON MANUFACTURING CO., LTD., London, N.W.10 (Willesden 0073).—Air-survey cameras and new "Multiplex" designs, demonstrating continuing progress in air-survey equipment. **S.B.A.C. Stand 57.**

WILTSHIRE SCHOOL OF FLYING, LTD., Truxton Aerodrome, Andover, Hants (Weyhill 352).—Flying instruction for Commercial Pilot's Licence, Private Pilot's Licence, instrument flying and night flying. Workshop for complete overhaul of aircraft and engine workshop for complete overhaul of Cirrus Minor II engines.

Y.S.C., LTD., THE.—See under "Aircraft Parts."

"FLIGHT" AND "AIRCRAFT PRODUCTION"

THESE two publications of Associated Iliffe Press, Ltd., together with copies of the book *Gas Turbines and Jet Propulsion*, will be available on our own stand in the Static Show—**No. 170.** Postcard-size photographic reproductions of modern British aircraft will also be on sale.



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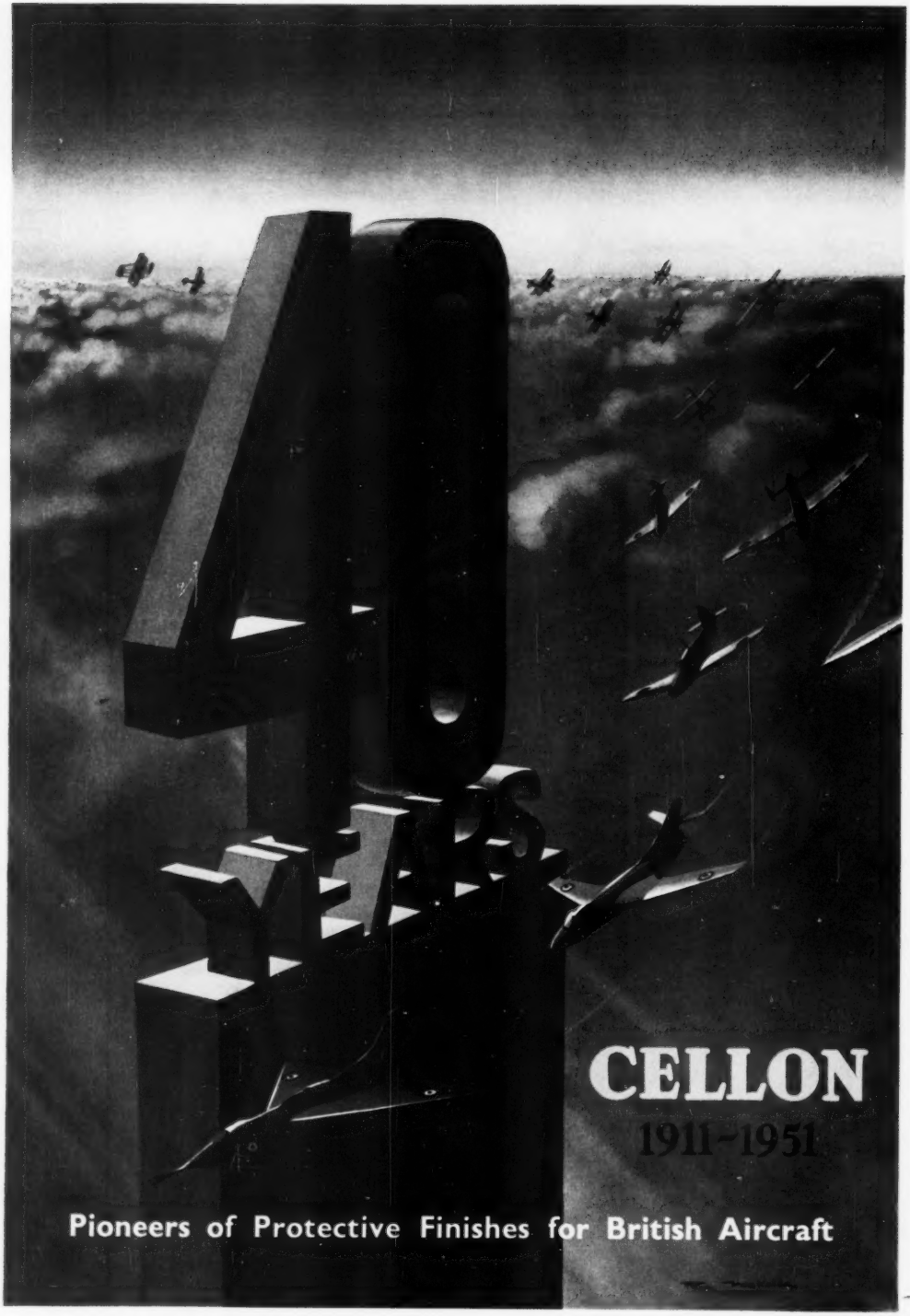

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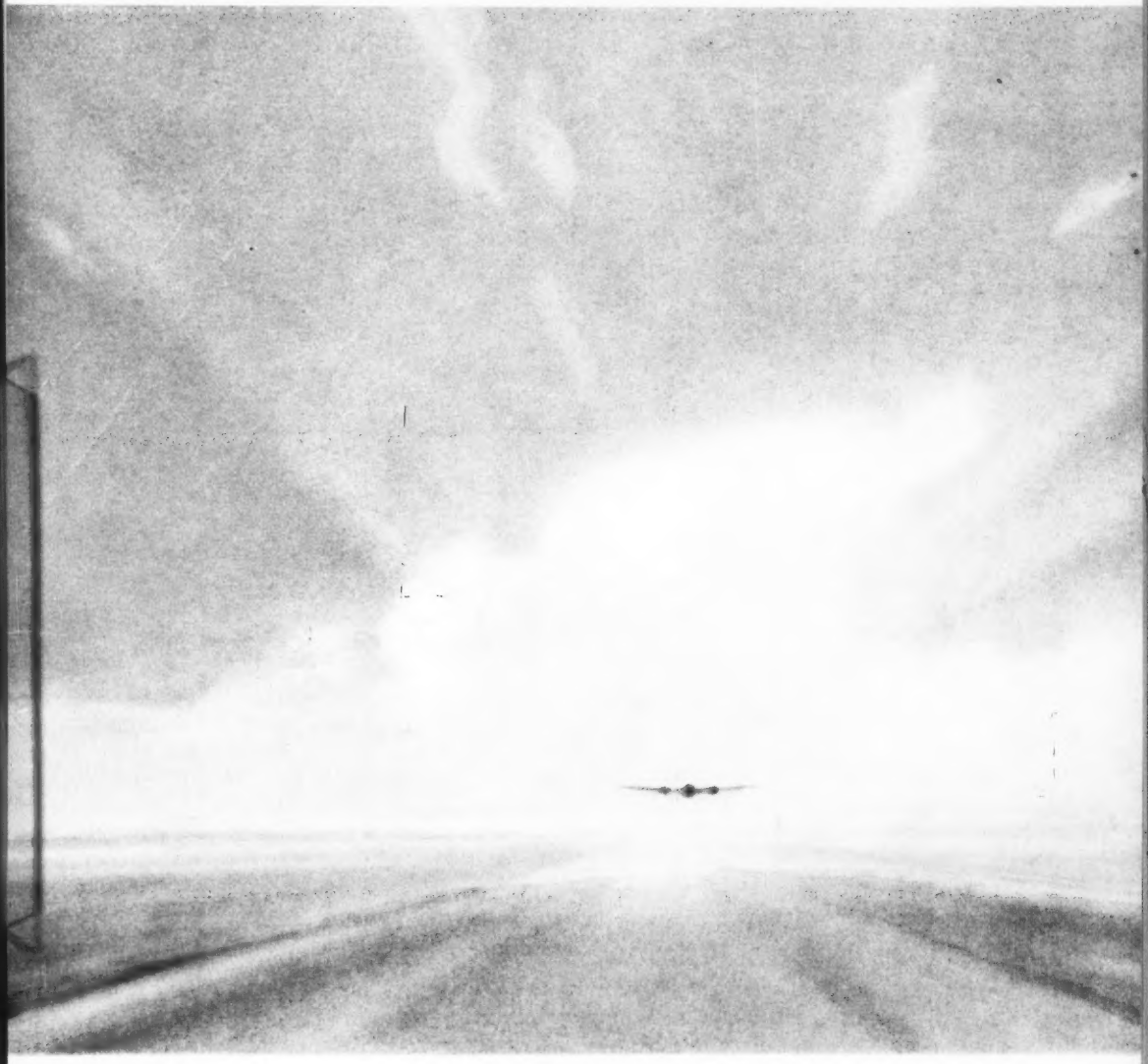

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A Napier Nomad engine will be shown on Stand A at the 1951 S.B.A.C. Exhibition.

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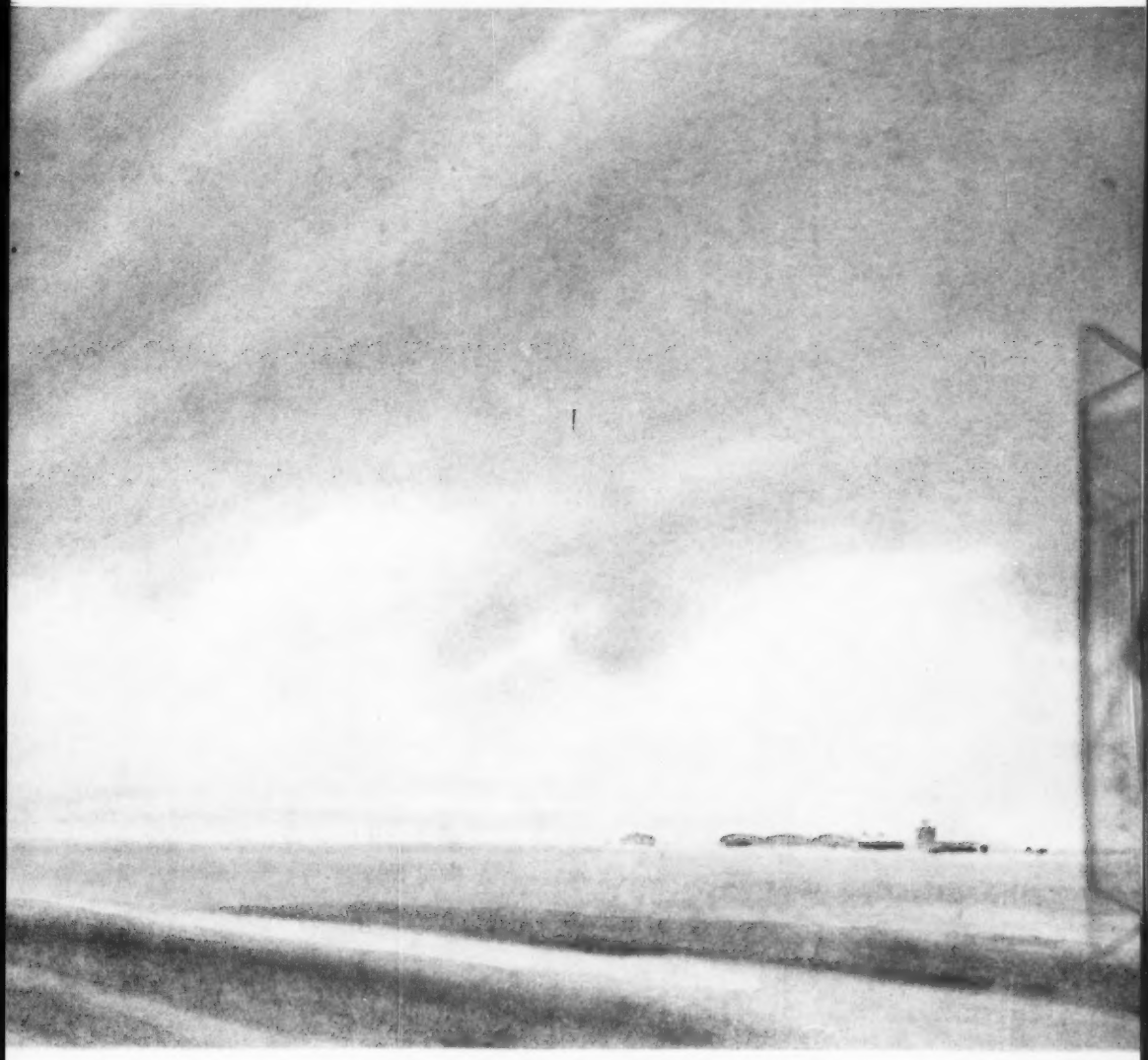

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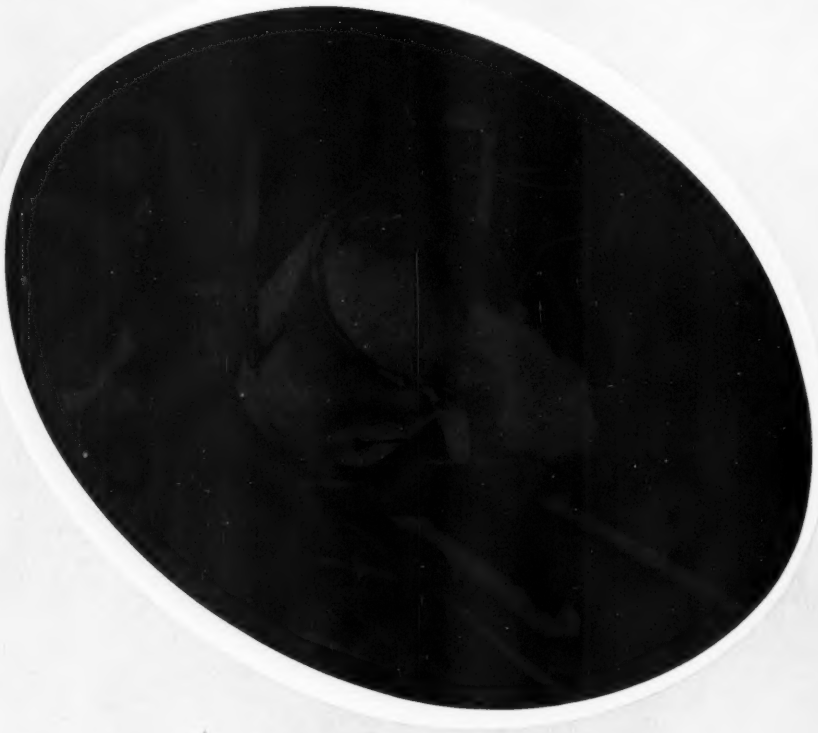

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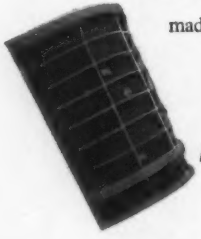

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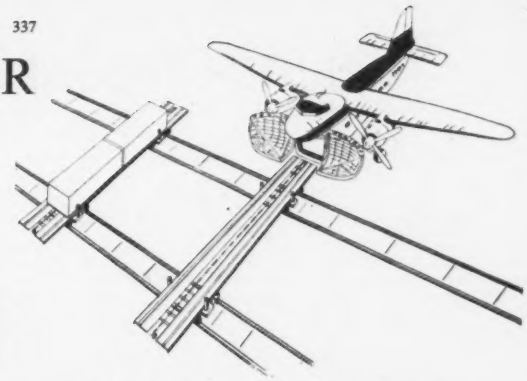


How the mobile platforms are used to load the Bristol Freighters

WHEN Straits Air Freight Express, Ltd., a New Zealand associate of Airwork, Ltd., recently began to operate a cargo airlift across the Cook Strait, to link the railway systems of the North and South Islands of New Zealand, one of the biggest problems concerned the need to cut turn-round times to a minimum.

The distance between the two terminals—Paraparaumu in the North Island and Woodbourne in the South Island—is only 72 miles, and the company has but two Bristol Freighters. In order to lift more than 14,000 tons deadweight of mixed cargo every year maximum utilization of the two aircraft is necessary, and this means paring down time on the ground at each terminal.

The usual method of loading and unloading the Freighters through the wide-opening front doors has been by the use of fork-lift trucks and manual labour, the operations being carried out with the trucks backed up to the nose of the aircraft. Mobile cargo, such as tractors and motor-cars, has been driven up ramps into the Freighters under its own power.

Using these methods, it takes S.A.F.E. about 60 minutes to unload a Freighter and re-load it for the return flight. As the block-to-block time for the trip is only 30 minutes, the key to successful operation in this case obviously lies in speeding-up loading and unloading.

Engineers of New Zealand Government Railways have now co-operated with the company to produce a mechanical loading platform which, by dispensing with manual handling of the cargo, will cut down the time on the ground from 60 to 10 minutes. The device is believed to be unique, and might well be valuable to others if it proves to be as good as its designers hope.

Essentially, the platform consists of two sets of railway lines laid parallel to each other and suitably spaced. Across them are straddled, at right angles, two trolleys, known as "traversers," which run along the rails. Each traverser has room on its flat top for two "cargons," metal containers which, placed end to end, would exactly fill the freighter's hold.

When the laden aircraft comes in it taxis up to the loading platform and stops, with nose doors open, hard up against an empty traverser, which is then adjusted to bring it exactly level with the floor of the aircraft hold. Two cargons, each filled with freight, are then slid from the machine on to the deck of the traverser, which is wheeled aside for unloading on to a motor-truck. The other traverser, with its full cargons, is wheeled into position in front of the aircraft and the cargons pushed inside.

This equipment is expected to be completed and put into service in the near future; the results will be watched with interest.

THE PIASECKI HELICOPTER LECTURE

U.S. Designer on the "Unique" Potentialities of Rotary-wing Transports

Frank N. Piasecki.

TWO important events in the fixture-list of the Helicopter Association of Great Britain took place last Friday, when, at the Institution of Civil Engineers, Mr. Frank N. Piasecki read his paper, *Military Aspects of the Transport Helicopter*, and the lecture was followed by the Association's annual dinner at Londonderry House, Park Lane.

Mr. Piasecki, at 31 years of age, is chairman of the board of directors of the Piasecki Helicopter Corporation, and the pioneer in the development of tandem-rotor transport-type helicopters in America. He is a graduate of the Guggenheim School of Aeronautics at New York University, and he has gained experience with several aviation concerns, including the Kellett Autogiro Company. Mr. Piasecki flew the second successful helicopter to become airborne in America, the PV-2; this was in 1943. He was, in fact, the first man to qualify with the C.A.A. as a helicopter pilot before receiving a "fixed-wing" licence. Since then he has done most of the original test flying on helicopters of his own design, and has flown 16 different rotary-wing aircraft at home and abroad. In January this year he received the Lawrence Sperry Award of the Institute of the Aeronautical Sciences for his outstanding contributions to helicopter design and development.

After a general introduction to his paper, Mr. Piasecki dealt with applications of the transport helicopter under such headings as construction work; development of new areas; laying of pipelines; land, sea and Arctic rescue; medical duties; and salvage. Later, under the headings of defence and attack, he talked of anti-submarine warfare and mine-sweeping, and assault transport. This led to another section dealing with initial, operating and maintenance costs. In his conclusions, Mr. Piasecki stated that it was evident that the helicopter had the unique ability to perform certain functions that could not be performed by any other means; for example, evacuation from contaminated atomic areas. For such work, the helicopter's value was infinite, and therefore it would be meaningless to compare the relative cost of such operations with other standard means of transportation even if the helicopter's costs, both initial and operating, were many times greater. Yet, in most of these "monopoly" applications, a standard type of transport helicopter could be used without the requirement for special, single-duty, stand-by equipment which would become an economic burden. The helicopter was basically a vehicle, and not a weapon or machine that was specialized functionally in its design.

In the main, the helicopter's major value lay in performing routine missions with an increase in efficiency over existing methods, such that the additional cost of operating the helicopter was far outweighed.

Sympathetic trials and testing would result in the application of the transport helicopter to many new military tasks of real advantage, said the lecturer. With broader use, many of the unknowns which were now the subject of speculation could be attacked and solved.

The cumulative effect of the reductions of time in transport and in transfer of military materiel and personnel in the large-scale operations of our military establishments was beyond the scope of his paper. However, added Mr. Piasecki, the effect of higher transport efficiency on the movement of military materiel and personnel in a perimeter war operation, or in preparation therefor, could substantially reduce the overall size of standing armies and navies.

The rapidly increasing load-carrying capacity of the helicopter, its ability to land at almost any spot, its hovering qualities and its reasonably rapid forward speed, gave it a place that fixed-wing aircraft could not fill. It also had the ability to operate under conditions of low visibility at times when fixed-wing aircraft were grounded. The transport helicopter, in fact, was ready for service.

BRITISH MILITARY AIRCRAFT, 1951

Maker and Type	Main Duties	Span	Length	Power Unit(s)			Normal a.u.w.	Wing Loading	Armament (see note 2)			Max. Speed		Climb		Typical Range
				No.	Type	Power (see note 1)			Guns	Bombs	R.P.s					
		ft in	ft in				lb	lb/sq ft	No.Cal. mm	No. Wt. lb	No. Wt. lb	m.p.h.	ft	to ft	min	miles
Armstrong Whitworth:																
Meteor N.F.11	F.	43 0	48 6	2	Derwent	n.a.	n.a.	n.a.	4 20	nil	nil	n.a.	n.a.	n.a.	n.a.	n.a.
Auster:																
Auster A.O.P.6	O.C.	36 0	23 2	1	Gipsy Major 7	145	2,160	11.75	nil	nil	nil	122	1,000	i.r.c. =	810 ft/min	290
Auster T.7	T.	36 0	23 2	1	Gipsy Major 7	145	2,190	11.9	nil	nil	nil	122	1,000	i.r.c. =	680 ft/min	290
Auster Model S	O.C.	32 0	23 9	1	Bombardier 702	180	n.a.	n.a.	nil	nil	nil	n.a.	n.a.	n.a.	n.a.	n.a.
Avro:																
Shackleton M.R.1	R.A.-S.	120 0	77 6	4	Griffon	n.a.	n.a.	n.a.	2 20	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Avro Canada:																
CF-100	F.	52 0	52 6	2	Orenda	n.a.	n.a.	n.a.	4 30	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Blackburn and General Aircraft:																
G.A.L.60	Tt.	162 0	99 2	4	Hercules	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Y.B.1	R.A.-S.	51 2	42 5	1	Double Mamba	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Y.A.5	R.A.-S.	44 2	42 5	1	Griffon	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Boulton Paul:																
Balliol T.2	T.	39 4	35 1½	1	Merlin 35	1,280	8,410	33.64	1 7.7	8 25	4 60	288	9,000	10,000	6	670
Sea Balliol T.21	T.	39 4	35 1½	1	Merlin 35	1,280	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Bristol:																
Brigand B.1	B.R.	72 4	46 4	2	Centaurus 57	5,620	39,000	54.3	4 20	2 1,000	8 60	358	16,000	20,000	17.7	1,850
Type 170 (Military)	Tt.	108 0	68 4	2	Hercules 734	4,000	42,000	28.2	nil	nil	nil	230	3,000	10,000	9.8	850
De Havilland:																
Vampire F.B.5	F.B.	38 0	30 9	1	Goblin 2	3,100	12,360 (note 3)	47	4 20	2 500	8 60	531	20,000	40,000	17.7	1,170
Vampire Trainer	T.	38 0	34 7	1	Goblin 3	3,350	11,030	44	4 20	2 500	8 60	536	20,000	40,000	16.3	840
Vampire N.F.10	F.	38 0	34 7	1	Goblin 3	3,350	n.a.	n.a.	4 20	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Venom F.B.1	F.B.	41 9 (note 4)	31 5	1	Ghost	n.a.	n.a.	n.a.	4 20	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Venom N.F.2	F.	41 9	35 4	1	Ghost	n.a.	n.a.	n.a.	4 20	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Sea Hornet F.R.20	F.R.	45 0	37 0	2	Merlin 130/131	3,540	18,530	51	4 20	2 1,000	8 60	467	22,000	i.r.c. =	4,650 ft/min	1,500
Chipmunk T.10	T.	34 4	25 5	1	Gipsy Major 10	145	2,000	11.56	nil	nil	nil	138	s.l.	10,000	14.5	292
English Electric:																
Canberra	B.R.	64 0	65 6	2	Avon or Sapphire	n.a.	n.a.	n.a.	nil	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Fairey:																
Firefly 5	R.A.-S.	41 2	37 11	1	Griffon 74	2,020	16,096	48.15	4 20	2 1,000	16 60	386	14,000	10,000	6.9	760
Firefly 6	A.-S.	41 2	37 11	1	Griffon	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Firefly 7	A.-S.	44 6	37 11	1	Griffon	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Gannet 1	A.-S.	54 4	43 0	1	Double Mamba	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Gloster:																
Meteor T.7	T.	37 2	43 6	2	Derwent 8	7,000	14,000	40	nil	nil	nil	585	s.l.	20,000	3.2	730
Meteor F.8	F.	37 2	43 6	2	Derwent 8	7,000	15,675	44.7	4 20	2 1,000	16 95	592	s.l.	20,000	3.6	995 (note 5)
Meteor F.R.9	F.R.	37 2	43 6	2	Derwent 8	7,000	15,770	45	4 20	2 1,000	8 95	596	s.l.	20,000	3.6	955 (note 6)
Meteor P.R.10	R.	43 0	44 3	2	Derwent 8	7,000	15,400	44	nil	nil	nil	575	20,000	20,000	3.5	1,380 (note7
Meteor P.V.	F.B.	41 0 (note 4)	44 0	2	Derwent 8	7,000	16,200	45.2	4 20	4 1,000	24 95	585	s.l.	n.a.	n.a.	n.a.
Handley Page:																
Hastings C.2	Tt.	113 0	81 8	4	Hercules 106	6,700	80,000	56.8	nil	nil	nil	348	22,200	10,000	12.5	2,000
Hastings C.3	Tt.	113 0	81 8	4	Hercules 737	8,160	80,000	56.8	nil	nil	nil	n.a.	n.a.	10,000	9.3	2,000
H.P.R.2	T.	37 0	29 11	1	Leonides 502/4	550	4,400	19.73	nil	nil	nil	190	2,500	10,000	7.8	485
Hawker:																
P.1067	F.	n.a.	n.a.	1	Avon	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Sea Hawk F.1	F.	39 0	40 0	1	Nene	n.a.	n.a.	n.a.	4 20	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Sea Fury F.B.11	F.B.R.	38 5	34 7	1	Centaurus 18	2,470	12,350	44	4 20	2 1,000	12 60	450	20,000	30,000	10.8	1,800
Percival:																
Provost T.1	T.	35 2	29 0	1	Leonides 25	550	4,250	19.9	nil	nil	nil	200	2,500	10,000	6.5	660
Sea Prince T.1	T.	56 0	46 4	2	Leonides 25	550	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Sea Prince C.1	Tt.	56 0	42 10	2	Leonides 502/4	550	11,000	31.3	nil	nil	nil	232	2,500	10,000	9	650
Saunders-Roe:																
S.R.A/1	F.B.	46 0	50 0	2	Beryl	7,700	16,255	39.1	4 20	n.a.	n.a.	500 (app.)	s.l.	n.a.	n.a.	n.a.
Short:																
Sturgeon T.T.2	Tar.	59 9	48 9	2	Merlin 140	3,320	22,350	34.2	nil	nil	nil	370	24,500	10,000	4	870
S.B.3	A-S.	59	11	2	Mamba	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
S.A./4	B.	—	—	4	Avon	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Vickers-Armstrongs:																
Valiant	B.	n.a.	n.a.	4	Avon	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Varsity T.1	T.	95 8	67 6	2	Hercules 264	3,900	37,500	38.5	nil	24 25	nil	290	5,000	10,000	7.5	1,500
Valetta T.3	Tt.	89 3	65 2	2	Hercules 230	3,950	36,500	41	nil	nil	nil	291	10,000	n.a.	n.a.	1,410
Vickers-Supermarine:																
Swift F.1	F.	n.a.	n.a.	1	Avon	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Attacker F.1	F.B.	36 11	37 1	1	Nene 3	5,000	11,750	52	4 20	2 1,000	8 60	585	s.l.	30,000	7.1	1,190
Type 535	F.	31 8½	42 11	1	Nene or Avon	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Seagull	Res. R.	50 6	44 1½	1	Griffon R.G.305.M.	2,500	14,500	33.6	nil	nil	nil	260	11,800	i.r.c.	1,430	875
Westland																
Wyvern T.F.2 and 4	Tor.F.B.	44 0	42 3	1	Python	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Abbreviations: A-S.=anti-submarine; a.u.w.=all-up weight; B.=bomber; C.=communications; end.=endurance; F.=fighter; i.r.c.=initial rate of climb (ft/min); n.a.=not available; O.=observation; R.=reconnaissance; Res.=rescue; R.P.=rocket projectile; T.=training; Tar=target tug; Tor.=torpedo; Tt.=transport.

Notes: (1) For piston engines, power (in h.p.) is for take-off; for turbojets thrust (in lb) is static. (2) Bomb and R.P. loads are generally alternatives. (3) Weight quoted is with 2 x 500-lb bombs plus 8 x 60-lb R.P.s. (4) Measured over tip-tanks. (5) At 19,040 lb a.u.w. (6) At 19,135 lb a.u.w. (7) At 18,765 lb a.u.w.

BRITISH CIVIL AIRCRAFT, 1951

Maker and Type	Span	Length	Power Unit(s) No.	Power Unit(s) Type	Power (see note 1)	Normal a.u.w.	Wing Loading	Max. Disposable Load	Volumetric Payload Capacity	No. of Pass.	Cabin Air (see note 2)	Max. Still-Air Range	Typical Performance Range	Height	Speed	Payload	Take-off to 50 ft (I.C.A.N.)
	ft in	ft in				lb	lb/sq ft	lb	cu ft			miles	miles	ft	m.p.h.	lb	yd
Airspeed:																	
Ambassador ...	115 0	82 0	2	Centaurus 661	5,250	52,500	43.7	16,276	2,540	47/49	P.	1,660	840	20,000	220	11,650	1,140
Armstrong Whitworth:																	
Apollo	92 0	71 5½	4	Mamba ASM.3	5,080	45,000	45.7	16,050	1,530	26/31	P.	1,350	Max. c	ont. spe	ed, 310	m.p.h.	—
Auster:																	
Autocrat	36 0	23 6	1	Gipsy Major 1	130	2,150	11.7	988	—	2/3	—	375	150	s.l.	95	988	180 (note 3)
Autocar	36 0	22 10	1	Gipsy Major 1	130	2,400	13	987	62	3	—	490	490	1,000	100	—	615
Aiglet	36 0	23 3	1	Gipsy Major 1	130	2,000	10.8	785	58	2/3	—	455	455	1,000	103	—	380
Aiglet Trainer ...	32 0	23 3	1	Gipsy Major 1	130	—	—	—	—	1/2	—	—	—	—	—	—	—
Avro Canada:																	
Jetliner	98 1	82 9	4	Derwent ...	14,000	60,000	51.8	—	—	—	—	—	—	—	450	—	—
Blackburn and General Aircraft:																	
Universal Freighter Mk 1	162 0	99 2	4	Hercules 730	8,080	103,000	35.4	38,000	5,700	18/72	—	—	500	8,000	163	26,000	1,000
Universal Freighter Mk 2	162 0	99 2	4	Centaurus 171	11,760	127,000	43.6	52,500	5,700	18/72	—	—	500	8,000	175	44,000	1,100
Bristol:																	
Brabazon I, Mk 1 ...	230 0	177 0	8	Centaurus 20	18,880	290,000	54.5	123,000	—	100	P.	5,450	5,450	25,000	250	—	1,800
Brabazon I, Mk 2 ...	230 0	178 10	8	Proteus ...	28,060	300,000	53.6	128,000	—	100	P.	5,450	5,450	35,000	350	—	1,525
Type 175	140 0	114 0	4	Proteus ...	14,240	130,000	63.3	—	—	50/104	P.	4,800	3,200	27,000	355	25,000	1,170
Type 170, Mk 31 ...	108 0	68 4	2	Hercules 734	4,000	42,000	28.2	15,335	2,360	48	—	—	850	5,000	166	10,000	776
Chrislea:																	
Super Ace II ...	36 0	21 6	1	Gipsy Major 10	145	2,350	13.3	1,007	—	3	—	440	400	2,000	112	610	250
Skyjeep	36 0	21 10	1	Cirrus Major III	145	2,550	14.4	830	103	3	—	520	345	2,000	115	610	250
Dart:																	
Kitten	31 9	21 4	1	Aeroncal A.P.	36	748	5.8	242	—	—	—	340	—	s.l.	83	—	—
De Havilland:																	
Comet, Series I ...	115 0	93 0	4	Ghost 50 ...	20,000	105,000	52.1	—	2,478	36/44	P.	3,540	3,540	40,000	490	13,500	—
Comet, Series II ...	115 0	93 0	4	Avon ...	26,000	—	—	—	—	—	P.	—	—	—	—	—	—
Dove	57 0	39 4	2	Gipsy Queen 70	680	8,500	25.3	1,862	392	8/11	—	1,153	1,153	8,000	165	1,185	790
Heron	71 6	45 6	4	Gipsy Queen 30, Mk 2	1,000	12,500	25.6	3,420	586	14/17	—	1,250	1,250	8,000	160	1,750	700
Beaver	48 0	32 9	1	Wasp Junior	450	4,500	18	1,260	144	4/6	—	—	645	5,000	137	910	293
King Beaver ...	58 0	32 9	1	Wasp ...	600	7,200	—	—	—	8/14	—	—	500	—	128	2,175	—
Drover	57 0	36 6	3	Gipsy Major 10	435	6,500	20	2,400	290	6/7	—	800	500	5,000	135	1,503	750
Handley Page:																	
Hermes IV ...	113 0	96 10	4	Hercules 763	8,400	86,000	61.1	32,069	3,754	40/74	P.	—	2,000	20,000	274	14,400	1,362
Hermes V	113 0	96 10	4	Theseus ...	11,240	90,000	63.8	27,113	3,754	40/74	P.	—	2,000	24,400	350	14,320	1,360
Handley Page (Reading):																	
Marathon I	65 0	52 3	4	Gipsy Queen 70-3 or 70-4	1,360	18,000	36.14	6,312	1,010	18/22	—	—	500	10,000	209	4,620	1,030
Miles:																	
Aries	36 2	22 3	2	Cirrus Major C	310	3,475				3							
Percival:																	
Prince Series III ...	56 0	42 10	2	Leonides 502/4	1,100	11,000	31.1	3,190	620	8/12	—	—	650	5,000	151	1,660	760
Survey Prince ...	56 0	45 3½	2	Leonides 502/4	1,100	11,000	31.1	3,055	620	8/10	—	—	1,180	5,000	151	—	760
Saunders-Roe:																	
Princess	219 6	148 0	10	Proteus ...	35,000	315,000	63	—	13,500	105	P.	5,500	5,500	37,000	380	—	—
Duchess	135 6	124 6	6	Ghost ...	20,000	130,000	55	—	—	74	P.	3,100	2,000	—	468	—	—
Scottish Aviation:																	
Pioneer Mk II ...	49 9	34 6	1	Leonides ...	520	5,400	13.9	1,300	80	4	—	—	400	5,000	120	850	230
Short:																	
Sealand Mk I ...	61 6	42 2	2	Gipsy Queen 70-3	680	9,100	25.4	1,868	410	5/8	—	950	600	5,000	127	935	1,030
Slingsby:																	
Motor Tutor ...	43 4	20 10	1	Aeroncal A.P.	37	790	4.7	—	—	—	—	200	200	1,000	60	—	—
Vickers-Armstrongs:																	
Viscount 700 ...	94 0	81 2	4	Dart RDa3 ...	6,040	52,500	54.5	20,500	2,660	40/48	P.	2,050	880	25,000	316	12,740	1,350

Notes: (1) For piston engines, power (in h.p.) is for take-off; for turboprops an equivalent brake horsepower is given; for turbojets thrust (in lb) is static. (2) P = pressurized. (3) Ground run.

HELICOPTERS

Maker and Type	Rotor Diam.	Length	Power Unit(s) No.	Power Unit(s) Type	Power	a.u.w.	Disc Loading	Disposable Load	Payload Capacity	No. of Pass.	Typical Performance Range	Height	Speed	Payload
	ft in	ft in			h.p.	lb	lb/sq ft	lb	cu ft		miles	ft	m.p.h.	lb
Bristol:														
171 Mk 3 (Sycamore)	48 6½	43 8½	1	Leonides Le23 H.M.	550	5,200	n.a.	997	—	3/4	324	s.l.	84	—
173	48 7	—	2	Leonides Le23 H.M.V. Mk 73	1,100	10,600	2.85	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Cierva (Saunders-Roe):														
Skeeter 3	32 0	31 2	1	Gipsy Major ...	150	2,000	n.a.	550	n.a.	1	n.a.	n.a.	80	n.a.
Skeeter 4	32 0	31 2	1	Bombardier ...	180	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Air Horse	95 0	88 7	1	Merlin 24 ...	1,620	17,500	n.a.	n.a.	n.a.	24	n.a.	n.a.	116	n.a.
Westland-Sikorsky:														
S-51 (Dragonfly)	48 0	57 0½	1	Leonides 521/1 ...	550	5,870	3.24	1,440	92	3	200	1,000	85	730
S-55	53 0	45 4½	1	Wasp R-1340 ...	600	6,800	3.08	2,031	340	8/10	86	1,000	—	—

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

The Price of Freedom

From the Rt. Hon. Lord Riverdale, G.B.E.

AS the end of Festival year approaches, one thing is certain—1951 will be memorable in the annals of the nation. May I take this opportunity of reminding readers of the words of the Dean of St. Paul's on the opening morning of the Festival. Dr. Matthews said: ". . . but for the Battle of Britain, not only would there have been no Festival of Britain—there would have been no Britain. . . . We must remember the young men whose sacrifices made the continued life of Britain possible."

We of the R.A.F. Benevolent Fund know only too well the price paid for the survival of our way of life. Every year we are still helping some 30,000 deserving cases from serving and ex-Service R.A.F. and W.R.A.F. members and their dependants—last year more than £608,000 was spent. The total of cases on our books is over 140,000.

Expenditure has been exceeding income by an alarming margin: during the past three years the Fund has spent £600,000 more than its revenue. Even more disturbing is the fact that calls upon the Fund are certain to increase owing to current price trends, the expansion of the R.A.F. and, particularly, the need to look after veterans of the last war in their old age.

The Fund has never yet had to refuse help to a deserving and eligible case. May I appeal to your readers to give whatever they can, however little, to make it possible for the Fund to maintain this proud record? All donations will be gratefully received at 1, Sloane Street, London, S.W.1. (Sloane 1681.)

London, S.W.1. RIVERDALE.
Chairman of the Council, R.A.F. Benevolent Fund.

About-face Arguments?

IN his letter of August 24th Mr. J. Scott says that advocates of rearward-facing seats are suspected of quoting accidents which support their case and conveniently ignoring others which don't; he quotes a Valetta crash in which he understands the passengers lost their lives through sitting in rearward-facing seats.

Passengers also lose their lives very frequently when ships sink or blow up, but this does not prevent others saving their lives through the provision of lifeboats and lifebelts.

Incidentally, the strengthening of rearward-facing seats to withstand additional g is an *extra* safeguard—the mere turning-round of seats of existing types would help to save life.

East Twickenham, Middlesex. D. HORNSEY.

Delta Topics

ONE of the extraordinary things about aeroplanes is that there are so many different ways of solving a given problem and it is not usually difficult to make out an equally good case for each.

Mr. Ewans in his very interesting article (August 10th) on the aerodynamics of the delta has—in the best tradition—made out a most convincing case for this particular shape as being the complete solution to the problem of high-speed-aircraft design.

During the last few years I have been trying to make out what I think is an even better case for an entirely different approach to the problem, namely, by a design employing variable sweep and which is the subject of a number of patent applications.

May I be forgiven, therefore, for falling to the temptation of questioning some of Mr. Ewans' claims for the delta—in particular, the claim that flaps are unnecessary because of the light wing loading?

I would have said that flaps are unnecessary because of the negligible lift-increment attainable with flaps on wings having large sweepback, and that, because of this disadvantage and the additional disadvantage of a low C_L max. without flaps, it is necessary for delta wings to be at least double the area of conventional unswept flapped wings for a given all-up weight and stalling speed. This results in a large increase in drag and structure-weight which more than offsets any gain due to eliminating the tail.

There is the further disadvantage that to achieve even the meagre maximum lift of the unflapped swept wing a very large incidence is required, due to the low aspect-ratio; and unless this interference with view and excessive change of attitude when landing is acceptable, an even greater wing area will be required for a given landing speed.

It seems, therefore, that the plan-form and other characteristics required for flight at speeds near and above the speed of sound are in direct conflict with those required for slow-speed flight; and, since the speed range should now be of the order of 10 to 1 or more, there is clearly a need for some means to change the plan-form and other characteristics to suit these extreme conditions.

It will be agreed that the change from the lightly loaded biplane to the highly loaded monoplane was not practicable until means were found for changing the wing camber by use of flaps to meet the conflicting requirements of low and high speed; it now appears to be at least as necessary to provide, in addition, means for changing the plan-form of aircraft to meet the conflicting requirements of low subsonic and supersonic flight speeds, and thus restore the C_L max., aspect ratio, lift slope, T/c and other characteristics to values suitable for low speed flight, without interfering with the characteristics desirable for high-speed flight.

Heston. L. E. BAYNES.

IT may be interesting to point out that the drawing enclosed with Mr. Dennis M. Powell's letter in your issue of August 24th is no doubt based on the drawing to British Specification No. 2115 dated July 19th, 1867, taken out by J. W. Butler and E. Edwards, which shows, as you say, an ordinary dart-shaped aeroplane. Incidentally, propulsion was not by a gunpowder rocket, but is described as "effected by the reaction of a jet of steam, etc., issuing from a pipe; in some cases two jets may be used, which may be regulated to affect steering."

London, W.C.1. W. LOCKWOOD MARSH.

A Correction to History

I NOTE in the article "The World's Speed Record," by H. J. Cooper (*Flight*, May 25th, 1951), that Table I (speeds from 1906 to 1913) gives Henry Farman as flying a Voisin, October 26th, 1907. I find this very hard to credit.

Henry and his brothers Maurice and Dick were well-established in the motor business in Paris before this. They had one of the best garages. Surely Henry and Maurice made their own aircraft from the start?

Furthermore, I was at the Paris Motor Show quite near this date and, meeting T. O. M. Sopwith, an old friend, we arranged to go out to Issy-les-Moul, where Henry Farman was doing practice flights. We saw these flights, and I am quite convinced that Farman was flying his early "Henry" machine. I remember the early Voisin—I saw it on a number of occasions—and one could not mistake any Henry machine for a Voisin. That, incidentally, was the first time Mr. Sopwith ever saw an aeroplane flying.

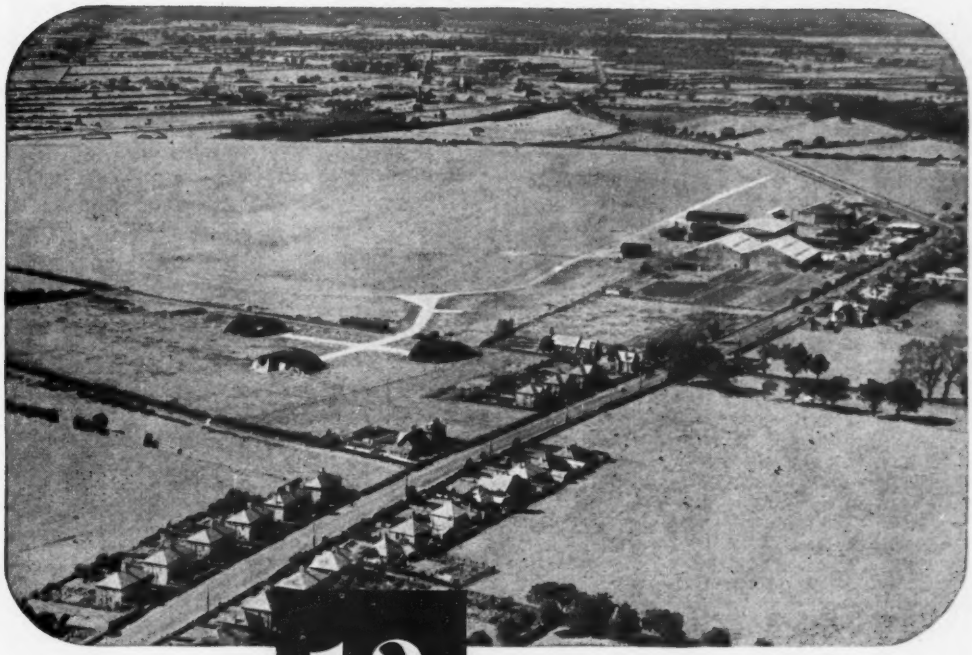
Cape Province, South Africa. HENRY KNOX.

[The author of the article writes: "I have investigated Mr. Knox's query, and it does in fact appear that the speed record of October 26th, 1907, by Farman, was made on one of his own designs and not a Voisin. I used the Royal Aero Club's official list as a basis for the article, and it quotes the type as being a Voisin; but according to the *Aeronautical Journal* of April, 1908, Farman flew his own design on October 26th, 1907, for a distance of 770 yards. The *F.A.I. Bulletin* quotes the distance for the record as 770 *metres*, so I should think that both refer to the same flight. Accurate information about these early records is very difficult to obtain, and the Club's list was in fact compiled in recent years from whatever particulars were available. The F.A.I. does not mention the type of aeroplane at all. I am obliged to Mr. Knox for raising the matter, and the official list is to be altered accordingly."—Ed.]

FORTHCOMING EVENTS

Sept.	3-7.	R.Ae.S. and I.Ae.S.: Third Anglo-American Aeronautical Conference, Brighton (now concluding).
Sept.	3-8.	British Interplanetary Society: International Congress on Astronautics.
Sept.	9.	Society of Model Aeronautical Engineers (Northern Area): Model Flying Festival.
Sept.	10.	R.Ae.S.: 39th Wilbur Wright Memorial Lecture—"The Well-tempered Aircraft," by A. E. Raymond.
Sept. 10-14.		I.A.T.A. Seventh Annual General Meeting, London.
Sept. 10-16.		Battle of Britain Week.
Sept. 11-16.		S.B.A.C.: Flying Display and Exhibition, Farnborough.
Sept.	14.	R.Ae.S. (Belfast): "Structural Problems of Future Aircraft," by Prof. N. J. Hoff (Polytechnic Institute of Brooklyn).
Sept. 15-16.		International Rally, Parme, Biarritz, France.
Sept.	16.	Wolverhampton Aero Club: "At Home."
Sept.	22.	*Daily Express* South Coast Air Race, Shoreham.
Sept.	25.	Milan International Grand Prix.
Oct.	4.	R.Ae.S.: Seventh British Commonwealth and Empire Lecture, "Air Transport in New Zealand and the South Pacific," by A. V-M. Sir L. M. Isitt, R.N.Z.A.F.
Oct.	31.	R.Ae.C.: Jubilee Ball.

Do you know your airfields?



13

Recognise this airfield? It's No. 13 in this series of puzzle photographs. You'll find the answer below on the right.★

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Hawker Sea Fury and Sea Hawk production. Photographs by courtesy of Hawker Aircraft Ltd.

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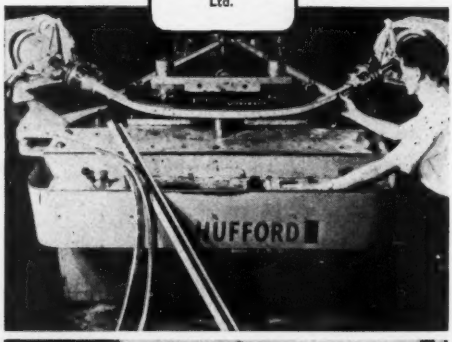
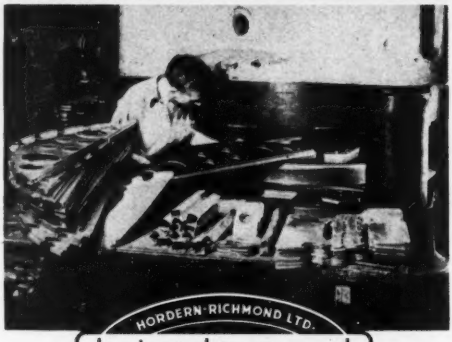


N. V. K. N. V. FOKKER (HOLLAND)

Shorts



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TO WORK WITH FIGHTER COMMAND: As recorded last week, the American squadron of twenty-five F-86 Sabres, which was held up in Labrador and Iceland by bad weather, arrived at Shepherds Grove airfield, Suffolk, on August 27th. The unit will form an integral part of the air defence organization in Britain.

Capturing a Mig-15

FURTHER details of the acquisition of a nearly intact Mig-15 from shallow waters on the west coast of Korea have been released by the Admiralty. The capture was effected by ships under the direction of Rear-Admiral A. K. Scott-Moncrieff, D.S.O., flying his flag in H.M.S. *Kenya*. After reports had been received of the position of the Mig, over 100 miles behind the enemy lines, Sea Fury pilots flew off H.M.S. *Glory* to fix the exact position and obtain photographs. This they did, and a decision was reached to attempt salvage. The U.S. Navy helicopter on loan to *Glory* was sent to mark the position and Capt. W. L. M. Brown, commanding H.M.S. *Cardigan Bay*, was given the task of retrieving the Mig.

Quite apart from the hazards inherent in operating so far behind enemy lines, Capt. Brown was confronted with a very real problem in that the area in which the aircraft lay could only be approached by shallow-draught craft, sailing through fast-running currents in a tortuous channel. At first it was thought possible to lash the Russian fighter to two junks at low water, towing it away when the tide rose. Later, however, it was found possible to borrow from the U.S. Navy a shallow-draught landing craft, carrying a mobile crane.

The naval party, made up of the *Cardigan Bay*, a South Korean motor launch and the U.S. landing craft, sailed to a position as near the derelict aircraft as the *Cardigan Bay* could reach, and on arrival at this rendezvous was covered by a screen of fighters from the *Glory*. To give warning of possible enemy air attack from the north, H.M.S. *Kenya*, stationed in Yalu Gulf, gave long-distance radar coverage. For the final stages of the operation, the *Cardigan Bay's* motor boat, in the charge of Lt. M. Ross, led the motor launch and landing craft up the channels, being itself guided by one of the escorting Sea Furies. Work was started as soon as the Mig was reached, but time did not permit the lifting to be completed in one tide; this necessitated an all-night stay in their exposed position. During this night H.M.S. *Glory* was relieved by U.S.S. *Sicily*, the aircraft from which covered the final stages of the recovery in the morning.

At the successful conclusion of the task, and to give good measure, *Sicily's* aircraft and the guns of *Cardigan Bay* bombarded an enemy gun position, obtaining direct hits.

The Mig-15 is now at the Wright-Patterson Air Force Base in America, for detailed study.

SERVICE AVIATION

Royal Air Force and Naval Aviation News

R.A.F. Ensign for Andover

AS a mark of the long association between the Royal Air Force and Andover, an R.A.F. Ensign was presented to the Borough at a ceremony held in front of the Guildhall on Friday last. The silken emblem was dedicated by the Assistant Chaplain-in-Chief, G/C. the Reverend N. F. Porter, K.H.C. and presented to the Mayor by Air Marshal Sir Thomas A. Warne-Browne, K.B.E., C.B., D.S.C., A.O.C-in-C. Maintenance Command. After the ceremony the Ensign was laid up in the nearby church of St. Mary's.

Carrier Movement

THE trials carrier, H.M.S. *Illustrious* (Capt. C. T. Jellicoe), now on a training cruise in the Mediterranean, will call at Malta during October to embark No. 827 Squadron and bring the unit back to Britain.

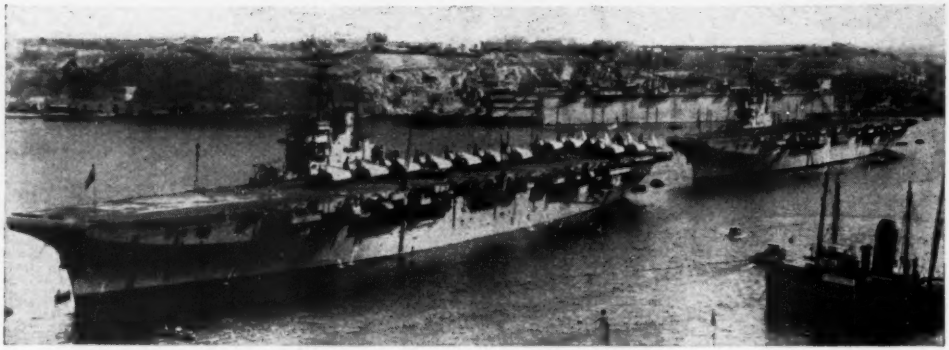
Malaya Command Change

HEADQUARTERS F.E.A.F. have announced that A.V-M. R. S. Blucke, A.O.C. Malaya, is returning to England owing to ill health. Pending the appointment of a successor the post will be filled by A. Cdre. J. L. F. Fuller-Good.

Technical Course Successes

DURING the past year, R.A.F. students attending the post-graduate courses at the College of Aeronautics, Cranfield, and the Department of Electronics, University College, Southampton, have been particularly successful. At Cranfield W/C. A. K. Hunter, O.B.E., B.Sc.(Eng.), A.F.R.Ae.S. and F/L. G. V. Cowmeadow, B.Sc., gained diplomas with distinction. The former specialized in aircraft econo-

RECEPTION: Sabre pilots of the U.S.A.F. with senior officers who welcomed them. (Left to right): Lt.-Col. F. W. Frost, who commands the unit; Col. R. J. Garrigan, group commanding officer; Major-Gen. Leon W. Johnson, commander of the U.S. 3rd Air Force; A.V-M. C. E. N. Guest, R.A.F., Assistant Chief of Air Staff (Operations); Lt. K. Bailey; Capt. L. M. McDonald and Lt. L. A. Howard.



IN VALETTA: The Canadian aircraft carrier H.M.C.S. "Magnificent" lying in the Grand Harbour at Malta with H.M.S. "Ocean" berthed astern.

SERVICE AVIATION . . .

mics and production and the latter in aircraft propulsion. Three other officers, W/C. L. Kelly, B.Sc., A.F.R.Ae.S., S/L. H. J. Knevitt, B.Sc.(Eng.), A.F.R.Ae.S., A.C.G.I. and F/O. R. Dawson, B.Sc., also gained diplomas.

The first three officers to be selected for the advanced electronics course at Southampton: S/L. D. W. Densham, B.Sc., A.R.C.S., F/L. J. D. Palmer, M.B.E., B.Sc. and F/L. K. B. Woods, B.Sc., were all successful in gaining diplomas—S/L. Densham getting First Class Honours and F/L. Palmer Second Class Honours.

R.A.A.F. and National Service

ACCORDING to reports from Australia a certain amount of discontent has been expressed by members of the Citizen Air Force who have not been drafted to the R.A.A.F. for their six-months period of continuous training. The authorities have reserved the right to direct National Servicemen to any of the three Services but it is felt that this disregard of the men's wishes may discourage others from joining the C.A.F. prior to call-up.

Benevolent Fund Expenditure

DURING the first half of this year £7,625 were spent by the R.A.F. Benevolent Fund on all forms of assistance to serving and ex-service members of the R.A.F. and W.R.A.F. Air Vice-Marshal Sir John Cordingly, Controller of the Fund, has said that expenditure continues to run at a very high level and gives cause for concern.

FOR LONG SERVICE: Air Marshal Sir Basil Embry pins the B.E.M. on F/S. C. E. Erskine, who has been a member of No. 602 (City of Edinburgh) Squadron, R.Aux.A.F., for 21 years. A similar award went to F/S. H. J. Henderson, who has put in 21 years' service with No. 603 (City of Glasgow) Squadron

Canadian Fighter Defence

CONTROL of all R.C.A.F. Reserve activities in Ontario, with the exception of Reserve University Flights, has been transferred from Training Command to the recently formed Air Defence Command. The move is in accordance with the emphasis now being placed on the R.C.A.F.'s fighter-defence scheme.

R.A.F. Appointment

THE Air Ministry announces the appointment of A.V-M. Allan Hesketh C.B., C.B.E., D.F.C., as Air Officer Commanding No. 21 Group, Training Command, from September 15th, 1951, in place of A. V-M. Lawrence Darvall, C.B., M.C., who is to become Commandant of the Joint Services Staff College.

R.A.F. Korean Awards

A NUMBER of awards have been made to members of R.A.F. flying-boat squadrons stationed at Iwakuni in Japan and operating over Korean waters.

W/C. P. de L. Le Cheminant, who receives a Bar to his D.F.C., was appointed to command a flying-boat squadron in September, 1949. The citation reads: "By his leadership and example he has maintained the morale and efficiency of his squadron at a very high level, and has himself flown on 22 sorties and invariably undertaken the most difficult sorties."

F/L. H. J. Houtheusen, awarded the D.F.C., has been captain of a crew which has carried out many successful operational flights. On the evening of January 18th, 1951, he landed his flying-boat in the sea off the North Korean coast to rescue an American pilot who had been forced down. This necessitated a night take-off from the open sea.

M.Eng. L. G. Ledingham, also, is awarded the D.F.C. Part of his citation reads: "He has flown 20 sorties involving 213 flying hours in the Korean campaign, and has at all times shown enthusiasm and efficiency of the highest order."

The D.F.M. is awarded to Sgt. G. J. F. McCourt for his work as a signaller. He has flown on 32 sorties in Korean waters, totalling 562 hours, and has contributed greatly to his squadron's success.

The following have been mentioned in despatches: F/Ls M. F. Aldersmith, G. A. Boston, K. Dandeker, D.F.C., K. J. Evans, G. Sproates and R. S. Stone; M.Sig. J. W. Gibson, D.F.M.; Sgts. G. A. H. Ashbrook, W. G. Holliday, G. R. Lee, R. H. Llewellyn and A. R Worthington.

International Win for A.T.C.

THE Highland drum and pipe band and cadet drill team, which gave such a splendid display in bad weather at White Waltham recently, has marched off with the General Beau Trophy at the fourth annual international air cadet drill competition. The contest was held at the Canadian National Exhibition and the trophy was presented by the donor, Gen. Lucas V. Beau, National Commander of the United States Civil Air Patrol.

Service Liabilities

A NEW Air Ministry pamphlet (A.M. Pamphlet 300) contains a tabulated summary of the service liabilities of retired officers and service pensioners of the Royal Air Force and members of the Royal Auxiliary Air Force, the Royal Air Force Reserve and Pre-Entry Forces, and the Royal Observer Corps. The pamphlet has been prepared specially to meet the needs of employers, trade union officials, public libraries, journalists and the like for information on this subject. Peacetime training liabilities are set out in one column, and liabilities for service in an emergency in another. A third column gives references for further information. Copies of the pamphlet may be obtained free of charge from the Officer-in-Charge, Air Publications and Forms Store, Government Buildings, Kidbrooke, London, S.E.3.

Officers on the Retired List of Women's Royal Air Force or of Princess Mary's Royal Air Force Nursing Service, as well as members of the Women's Royal Air Force Reserve of Officers or Princess Mary's Royal Air Force Nursing Service Reserve are among the classes dealt with in the pamphlet.

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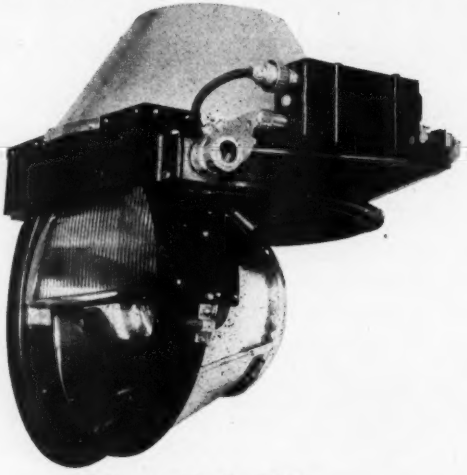

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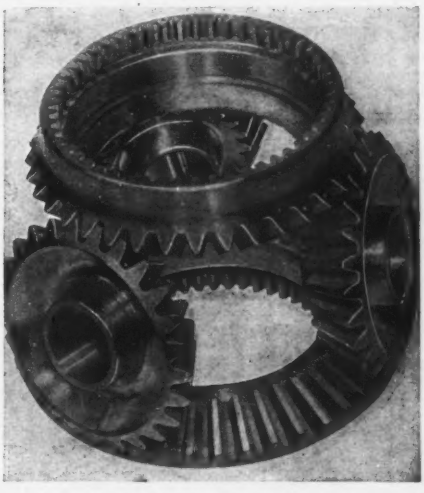

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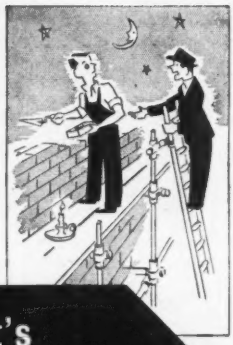

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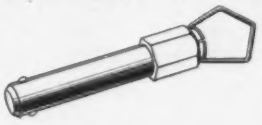

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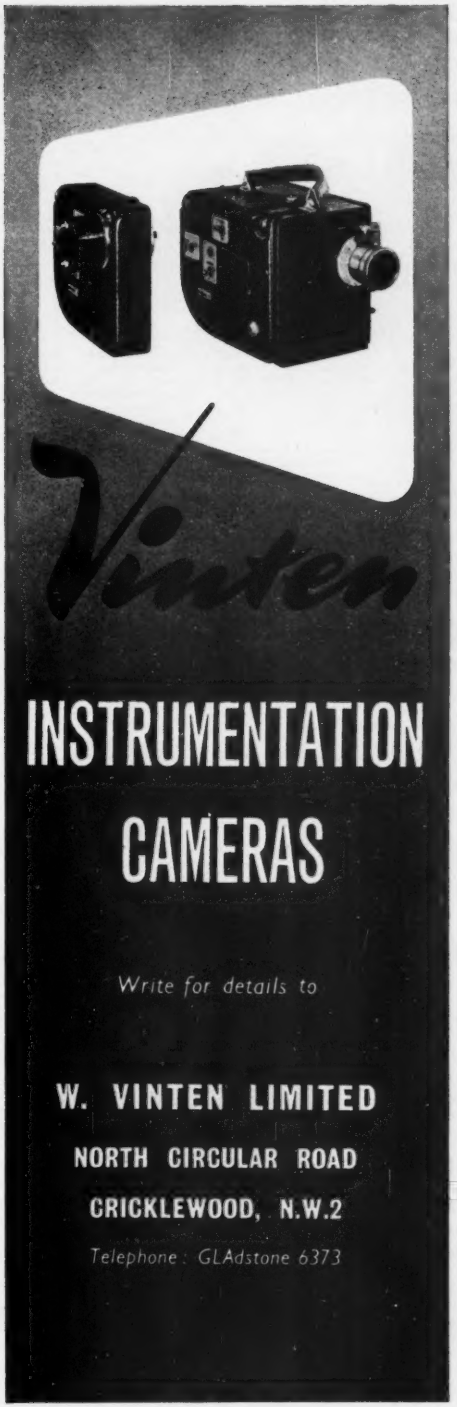

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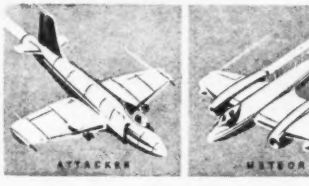

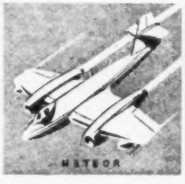

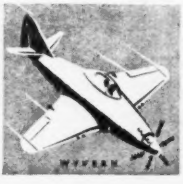

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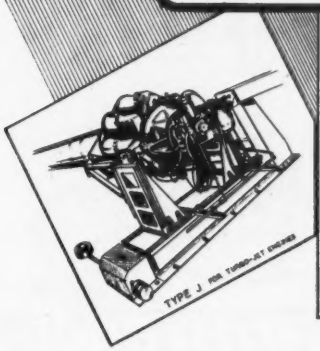

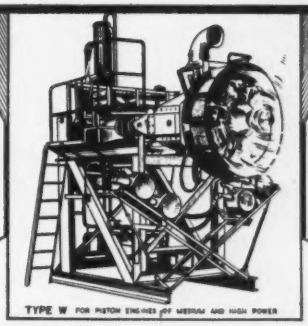

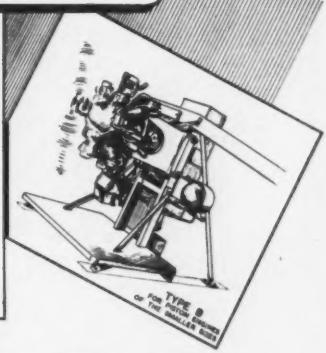

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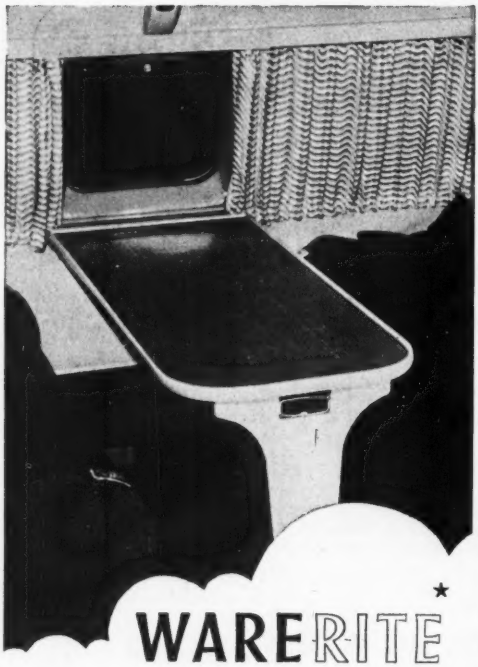

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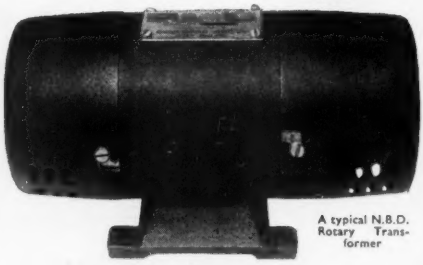

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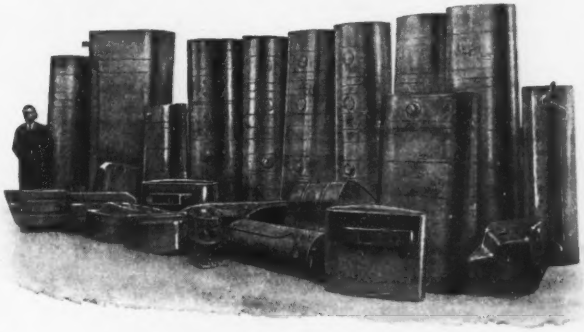

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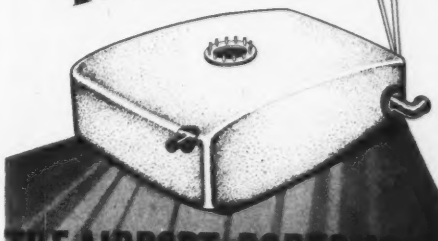

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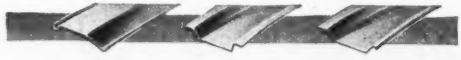

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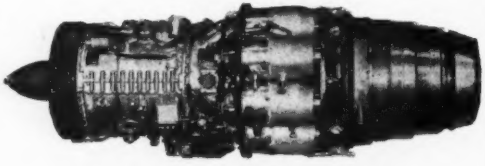

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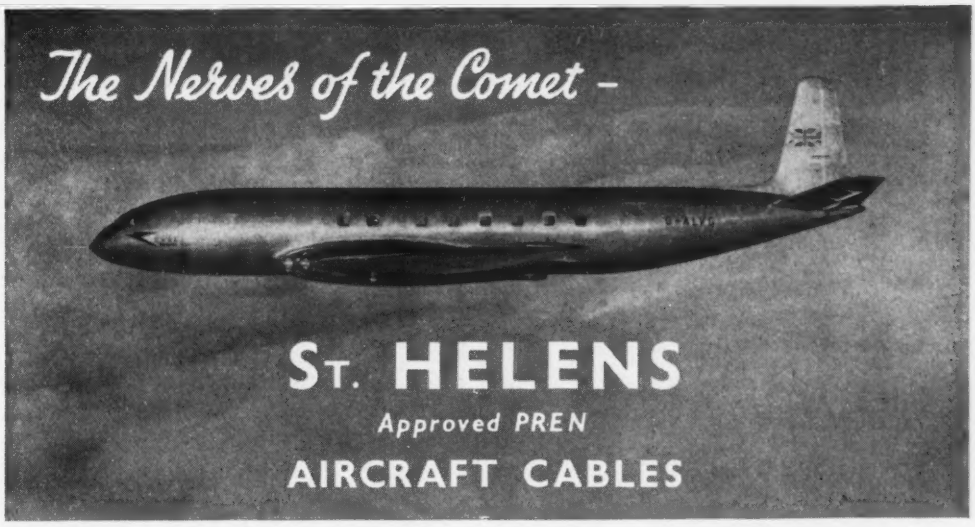

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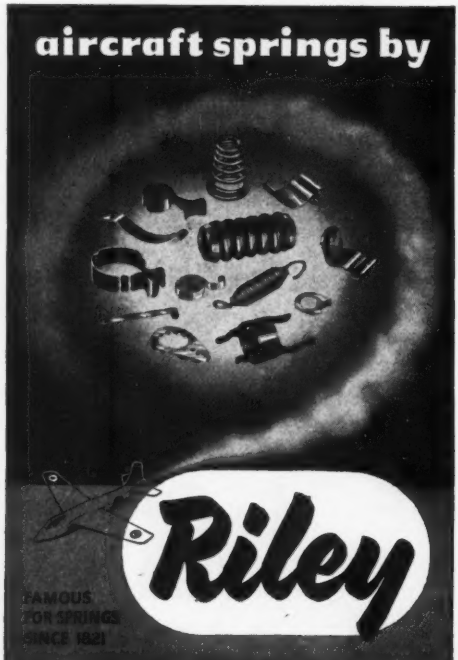

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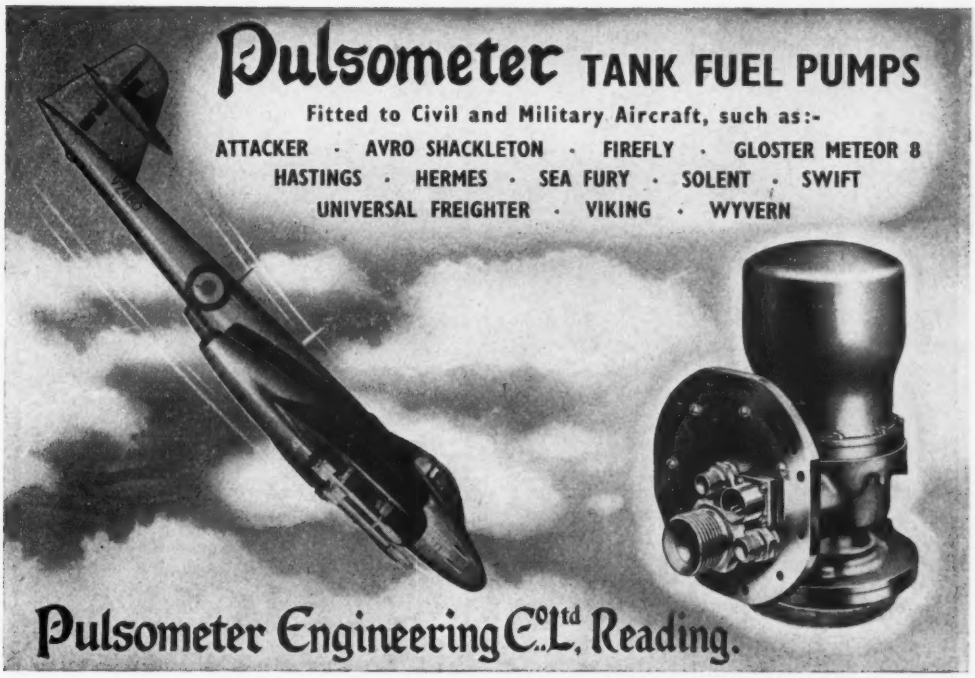

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NOTICE is hereby given that Electro-Hydraulics, Ltd. seek leave to amend the complete specification of Letters Patent No. 635,942 for an invention entitled "Improvements in or Relating to Aircraft Landing Gear." Particulars of the proposed amendments were set forth in the Official Journal (Patents), No. 3264, dated September 24th, 1951. Any person may give Notice of Opposition to the amendment by leaving Patents Form No. 36 at the Patent Office, 25 Southampton Buildings, London, W.C.2, on or before October 5th, 1951.—J. L. Blake, Comptroller-General. [6809

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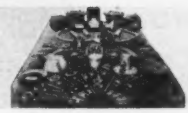

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WESTLAND AIRCRAFT, Ltd., have vacancies for the following:

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LICENSED aircraft radio engineer required immediately. —Apply to Chief Engineer, Eagle Aviation, Luton Airport, Beds. [0911

VICKERS-ARMSTRONGS, Ltd. (Aircraft Section) are shortly opening a design office at Hurn Airport and will be requiring the following staff:—

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AIRCRAFT stressmen.

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BRITISH OVERSEAS AIRWAYS CORPORATION offer opportunity of work on modern air liners to the following tradesmen:

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JIG and tool draughtsmen required. Previous aircraft experience not essential. Pension and life assurance schemes.—Apply: Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge. [0754

WANTED, flight engineers for York aircraft. "A" and "C" to cover York aircraft essential.—Apply: Chief Engineer, Eagle Aviation, Ltd., Luton Airport, Luton, Beds. [0810

SENIOR jig and tool draughtsman wanted.—Apply, giving details of experience and qualifications, to Personnel Officer, Westland Aircraft, Ltd., Yeovil, Somerset. [6890

TECHNICAL author required, experienced in M.o.S. procedure, also to generally assist in Contracts Dept., location Bedfordshire.—Write, stating age, experience and salary required, to Box 3746. [6881

FLYING control officer required for flying boat operations at Southampton.—Apply: Managing Director, Aquila Airways, Ltd., 6 Curzon Place, Park Lane, W.1. [6863

JIG and tool draughtsmen required. Previous aircraft experience not essential. Pension and life assurance schemes.—Apply: Employment Manager, Vickers-Armstrongs (Aircraft Section), Weybridge. [0606

APPRENTICE Supervisor of aircraft company in London area requires Assistant for apprenticeship scheme.—Experience, qualifications, age and salary expected to Box 3626. [6892

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APPLICATIONS should state full particulars of experience and qualifications and should be addressed to The Personnel Manager, The de Havilland Engine Co., Ltd., Stonegrove, Edgware, Middx. [6878

LANCASHIRE AIRCRAFT Corporation have vacancies for a few navigators with flight navigator's licence.—Apply to Personnel Manager, Lancashire Aircraft Corporation, Ltd., Bovingdon Airport, Hemel Hempstead, Herts. [6856

QUALIFIED photographer wanted, used to industrial photography and photographic processes.—Write, giving details of experience and qualifications, to Personnel Officer, Westland Aircraft, Ltd., Yeovil, Somerset. [6851

AERONAUTICAL or mechanical draughtsmen and stressmen required, all grades.—Apply, stating age, experience and salary required, to Alan Muntz and Co., Ltd., Aircraft Section, Heston Airport, Hounslow, Middx. [6754

SCHEDULE clerks required (male) with experience in compiling M.O.S. spares schedules.—Applications, in writing, stating age, experience and salary required, to Personnel Manager, Percival Aircraft, Ltd., The Airport, Luton, Beds. [0809

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GLOSTER AIRCRAFT Co., Ltd., have vacancies for fully experienced aircraft structural and electrical draughtsmen.—Applications, in writing, stating age, experience and salary required, to Employment Officer, G.A.C., Ltd., Hucclecote, Glos. [0910

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PLANNING engineers required by aircraft firm in Midlands. Previous aircraft experience desirable, but not essential. Positions offer good prospects to right type of applicant.—Write, stating age, experience and salary to Box 3677. [6842

FOLLAND AIRCRAFT, Ltd., require the services of a technical author. Knowledge of M.O.S. procedure desirable.—Reply, stating age and salary expected, to Personnel Manager, Folland Aircraft, Ltd., Hamble, Southampton. [0932

SENIOR and junior weight engineers required. Interesting work on new projects. Permanent positions offered to suitable applicants.—Apply, stating age, experience, qualifications and salary required, to Chief Designer, Gloster Aircraft Co., Ltd., Witcombe, Glos. [0912

H. M. HOBSON, Ltd., invite applications for positions in the drawing office as follows: designers, detail and modification draughtsmen, checkers, stressmen. The work is concerned with interesting projects connected with fuel metering equipment and hydraulic flying controls for aircraft.—Hobson Works, Fordhouse, Wolverhampton. [0420

APPLICATIONS are invited from senior and intermediate design draughtsmen; experience of aero engine design desirable but not essential. Please write, stating age and giving details of previous experience in chronological order, to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [0949

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ENGLISH ELECTRIC invites applications from suitably experienced draughtsmen for aircraft work at Warton or in London. Men interested in this permanent employment should write, quoting Ref. 120F, to Central Personnel Services, English Electric Co., Ltd., 24/30, Gillingham Street, London, S.W.1. [6901

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ROLLS-ROYCE, Ltd., Derby, have a vacancy for a man up to 25 years of age, to undertake training and duties in patent procedure; post offers good prospects. Applicants should have Higher National Certificate or degree in mechanical engineering. Salary according to age, qualifications and experience. [6826

THERE are still some vacancies for Senior Aerodynamicists, and Senior and Junior Stressmen in the Saunders-Roe design organisation.—Men of suitable ability and qualifications are invited to apply to the Personnel Officer, stating experience, qualifications, age and salary expected, to the Personnel Officer, East Cowes, I.O.W. [6897

A FIRST-CLASS designer is required to take charge of the London design office of a well-known firm producing aircraft equipment. Applicants must be fully conversant with general practice and be experienced in the design of equipment embodying light precision engineering and instrument practice. Only first-class men need apply.—Box 3701. [6850

AIRCRAFT stressman required immediately. Must hold B.Sc. in Engineering, or equivalent. Experience on stressing aircraft structures desirable, but applicants without experience will be considered.—Apply in first instance, giving full details of age, experience, etc., to Personnel Manager, Scottish Aviation, Ltd., Prestwick Airport, Ayrshire. [6895

AIRCRAFT engineers, fitters airframe, fitters engine, radio, electrical and instrument engineers and an experienced parachute packer are required for service at Bovingdon Airport. Good rates of pay, bonus and proficiency pay.—Apply in writing to Technical Manager, Lancashire Aircraft Corporation, Bovingdon Airport, Hemel Hempstead, Herts. [6765

AIR FORCE, Naval, civil and helicopter aircraft all under design and development at Percival Aircraft, Ltd. Applications are invited from senior and junior draughtsmen, and stressmen, for work on this interesting programme.—Write, giving details of experience and salary required, to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Luton, Beds. [0585

HANDLEY PAGE, Ltd., require an electrical technician, preferably with H.N.C. (Elect.), and with a knowledge of electronics, for work in connection with the development of aircraft electrical circuits and installations.—Write, stating age, qualifications and details of experience, to Staff Officer, Handley Page, Ltd., Cricklewood, London, N.W.2. [6752

DEVELOPMENT engineers and senior draughtsmen required with experience in light hydraulic controls and/or fuel metering equipment; also detailing draughtsmen for this type of work. The factory is situated in the grounds of a country house and the wages and conditions are excellent. Hostel available.—Write: Personnel Manager, Dowty Equipment, Ltd., Arle Court, Cheltenham. [0603

THE GLOSTER AIRCRAFT Co. requires senior and intermediate stressmen to work on designs and projects of advanced interest. Excellent prospects of advancement for sound and energetic men.—Apply, in first instance, giving full particulars of technical qualifications, age, experience and salary required, to The Chief Designer, Gloster Aircraft Co., Ltd., Hucclecote, Glos. [0911

HANDLEY PAGE, Ltd., have vacancies for senior and junior technical assistants in their mechanical and structural test departments at Cricklewood and Radlett. Qualifications should include a degree or Higher National Certificate. Previous experience is desirable but not essential.—Write, stating age, qualifications and details of experience, to Staff Officer, Handley Page, Ltd., Cricklewood, London, N.W.2. [6738

A TECHNICAL writer required by firm in N.W. London area manufacturing aircraft electrical equipment. Applicants must have concise style and be capable of compiling technical specifications from data or drawings. Electrical knowledge essential. The position is superannuated, and gives considerable scope to an ambitious man with adequate experience.—Write, stating experience, age and salary required, to Box 3778. [6870

HANDLEY PAGE, Ltd., have a vacancy for a technical assistant with a good mechanical engineering background, who will be required to carry out work in connection with thermo-dynamic problems for aircraft air conditioning and thermal de-icing systems.—Write, stating age, and giving particulars of qualifications and experience, to Staff Officer, Handley Page, Ltd., Claremont Road, London, N.W.2. [6751

BRITISH EUROPEAN AIRWAYS have vacancies for instrument mechanics, radio mechanics, electricians, sheet metal workers, airframe and engine fitters. Hourly rates 2/6d. plus 8 hours overtime, plus up to 3d. proficiency pay. Opportunity for good bonus earnings. Pension, insurance and sick pay schemes; two weeks' paid holiday a year; air travel concessions.—Apply: Personnel Officer, B.E.A., Northolt Base, Ruislip, Middlesex. [0741

A VACANCY exists in the electronics section of the research department for an electronics engineer, preferably with a degree in mathematics, for the design of equipment for electronic measurement of physical variables and associated problems.—Applications, stating age, qualifications, experience and salary required, should be addressed to the Personnel Officer, Westland Aircraft, Ltd., Yeovil, Somerset. [6846

TECHNICAL Assistants required in the Experimental Department. Sound engineering background essential, preferably with experience on gas turbine I.C. engines and component rig testing, capable of writing a comprehensive report on condition of engines, etc., after test.—Write, stating age, training, experience and salary required, to The Personnel Office, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlese. [6891x

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LANCASHIRE AIRCRAFT CORPORATION, Ltd., have immediate vacancies for airframe fitters, engine fitters, electricians, instrument mechanics, radio engineers, at Bovingdon and Blackpool. Good wages, proficiency pay and bonus. Two weeks' holiday with pay. Living accommodation is available for single men at Bovingdon.—Apply, in writing, or call at Bovingdon Airport, near Hemel Hempstead, or 11, Berkeley Street, London, W.1, or Squires Gate Airport, Blackpool. [6857

MECHANICAL engineer required, with experience of gas turbine practice, to act as technical liaison officer between well-known Sheffield steel firm and its customers for high temperature materials. Exceptionally interesting post for an enthusiast aged between 25-35. Applicants must be willing to travel, both at home and abroad. Knowledge of French or German would be helpful. Metallurgical knowledge an asset but not essential.—Apply, stating qualifications, salary desired and personal details, to Box 3747. [6868

THE GLOSTER AIRCRAFT Co. requires the services of a number of aerodynamicists, (a) for design and project work, and (b) for flight test reduction. Opportunity exists for individuals to vary their experience within the Aerodynamics Department. Candidates with some years' experience preferred, but applications from juniors with sound mathematical ability will receive full consideration. —Apply, in the first instance, giving full particulars of age, experience and salary required, to The Chief Designer, Gloster Aircraft Co., Ltd., Hucclecote, Glos. [0913

NORMALAIR, Ltd., invite applications from designers and draughtsmen for work in their London office in connection with aircraft air-conditioning, pressurizing and high altitude breathing equipment. Experience of aircraft equipment or delicate precision mechanisms is essential; only first-class qualified men will be considered.—Applications, stating age, experience, qualifications and salary required, should, in the first instance, be addressed to the Personnel Officer, Normalair, Ltd., Yeovil, Somerset. [6845

FLIGHT REFUELLING, Ltd. require junior stressmen and technician for interesting work on experimental aircraft installations. Minimum qualification H.N.C. (Mech.). Previous experience of aircraft component stress analysis essential. Commencing salary in the range of £400-£500 per annum according to qualifications and experience. Five-day 40-hour week. Pleasant working conditions. Canteen and sports club.—Apply, stating age, qualifications, experience and salary required, to Personnel Manager, Tarrant Rushton Airfield, Near Blandford, Dorset. [6883

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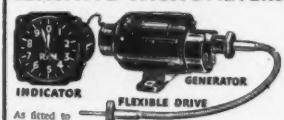

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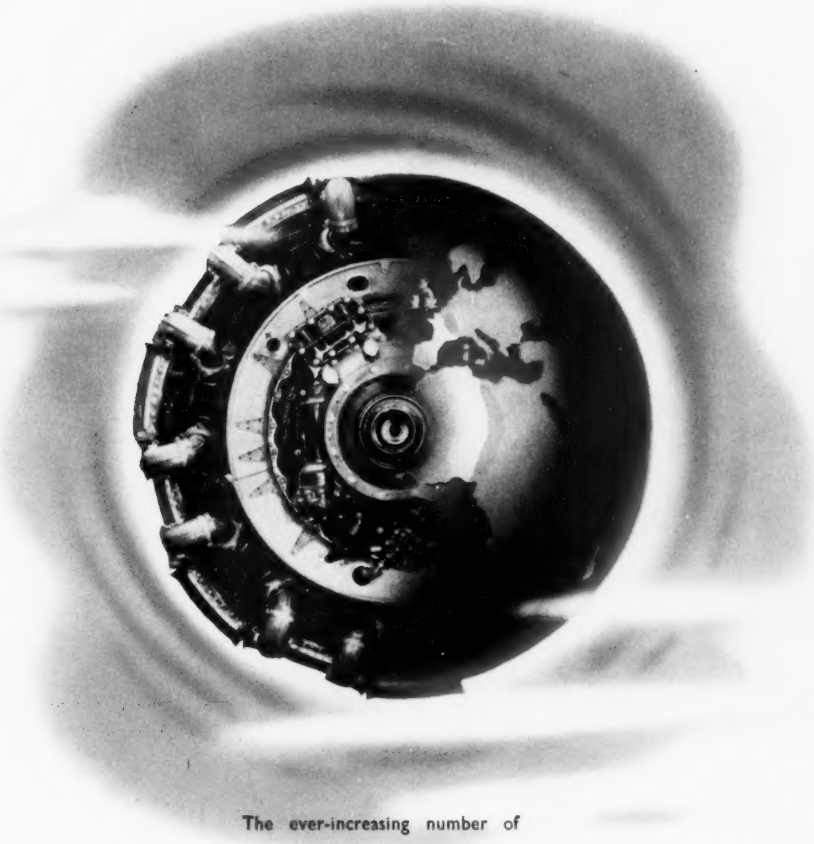

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